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S U R G E R Y:

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S Y S T E M
OF
S U R G E R Y.

CHAPTER XIV.
Diseases of the MOUTH.

SECTION IX.
Of Toothach.

TOOOTHACH appears to be more unsupportable than any other kind of pain. It renders all who labour under it very unhappy ; and being one of the most frequent diseases to which the human body

is liable, it necessarily becomes a frequent object of attention.

The pain induced by toothach, even when confined to a single tooth, is often productive of severe distress; but this is trifling when compared with the consequences that sometimes ensue from it. Instances, indeed, often occur of the most robust constitutions being ruined by frequent returns of it. Besides the usual symptoms of pain in one or more of the teeth, and of swelling in the contiguous gums, the cheek frequently swells to a large size; the eye, and even the ear of the affected side, are often attacked with pain and inflammation; and to these, fever, with all its consequences, is apt to succeed.

These symptoms may be induced by different causes, and by affections of the teeth seemingly of opposite natures.

1. They may proceed from the nerve and other parts within the cavity of a tooth being denuded, either by external violence,

violence, or by the enamel falling off as the effect of other diseases.

2. They may proceed from inflammation, either of the parts within the tooth, or of the membrane that surrounds the root of it. And,

3. The teeth and contiguous parts of the jaws are often attacked with pain in consequence of what is usually termed Sympathy ; that is, they often become pained from affections of distant parts, very severe fits of toothach being sometimes induced by diseases of the eye, of the ear, and stomach. I shall proceed to treat separately of these causes in the order they are here mentioned.

§ 1. *Of Toothach from the Nerve being laid bare, and of the Various Methods of extracting Teeth.*

IN whatever manner the cavity of a tooth be exposed, we find from daily observation, that for the most part it excites

much pain ; and the reason is obvious. Nature, as we have already observed, has provided the teeth with nerves, but at the same time she has given them a very complete covering of bone : When this protection, therefore, is destroyed, either by accident or disease, it might à priori be imagined, that these parts which were not formed for being exposed, would suffer various injuries, not merely from the action of food and drink in passing over them, but from the external air being at all times freely applied to them.

But it is not the mere exposure of a nerve, or the violence employed in laying it bare, that produces pain ; it is the consequence of this exposure, the effects that result from it, from which all the ensuing distress originates : Of this every practitioner must have met with frequent instances. Thus I have often known the cavity of a tooth laid open by the enamel being broken by a fall or a blow, and no inconvenience ensue but a slight degree of pain ; and it frequently happens, that the
enamel

enamel breaks off, and the rest of the teeth moulder away without any pain being produced : It is therefore evident, that exposure of the nerve alone is not the ultimate cause of toothach. It is a certain degree of irritability induced by this exposure that appears to be the cause of it ; and to this our views should be directed in the method of cure.

This irritable state of the nerve may be induced by various causes, and more especially by saccharine, acid, and other stimulating substances contained in food, being frequently applied to it ;—by the too frequent use of toothpicks, which may often be traced as the origin of toothach ;—and by much exposure to a stream of cold air. Exposure to cold, particularly in a damp state of the air, often terminates in toothach by inducing inflammation ; but it frequently excites very severe degrees of pain in teeth already deprived of part of their enamel, when no other symptom of inflammation is discovered.

These are the most common causes of toothach when the nerve of a tooth has previously been laid bare ; and in such circumstances their mode of operating may be easily explained ; but we cannot so easily suggest a reason for this state of a tooth being such a frequent occurrence, nor does it appear in what manner it is for the most part produced. The enamel is sometimes broken by falls and blows, and it frequently suffers by attempts to break nuts and other hard substances with the teeth : In such cases the cause is obvious ; for we know by daily observation, that the osseous part of a tooth very soon becomes carious, and wastes away on the enamel being destroyed. But how do we account for the most frequent of all causes of toothach, the decay or wasting of the enamel by rottenness, when no evident external violence has been done to it ? It has been alleged, that we may often trace it to a too free use of acids, and by some it is said that it depends most frequently upon a want of cleanliness in not washing

washing or otherwise clearing the mouth of putrescent particles after meals. Particles of food in a state of putrescency, by resting upon the teeth, are supposed to be capable of communicating some degree of their own nature to the enamel; and putrescency being produced even in a single point, the contiguous parts, it is supposed, will become diseased, from the same cause that mortification spreads in other parts of the body.

I will readily admit that a frequent application of acids, even of the mildest kind, will prove hurtful to the enamel; and therefore that they should be avoided; while it is equally clear, that the mouth should be regularly washed after meals, not only for preventing that kind of incrustation upon the teeth that we have already considered, but for preserving a sweetness of breath: It does not, however, appear, that the disease we are now considering, spoiled or carious teeth, depends upon either of these causes. Were it to originate from the too free use of

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acids,

acids, it ought to effect all the teeth equally, whereas it begins almost in every instance in a small point, or spot, which, in general, extends much more slowly than it probably would do if the disease was produced in this manner. And again, with respect to the effect of any putrescent particles lodging upon the teeth, it is not likely that this disease can be ever induced by them. A piece of meat remaining in the mouth from one meal to another, may acquire some degree of fœtor; but it cannot probably in that short period become so highly putrid as to destroy the living principle in those parts with which it comes in contact. It is a point, however, which may be easily determined by experiment; and from the result of some trials that I made for this purpose, there is reason to suppose that the common opinion with respect to it is ill-founded. A tooth newly pulled was put into the centre of a piece of putrid beef, and after remaining in it for eight days, it was as free from putrefaction,

tion, as when first put into it, neither the enamel nor internal parts of the tooth being in any degree injured; and the experiment being repeated with teeth that had been pulled for a considerable time, the result was exactly similar. Now, if this happens with teeth entirely dead, even when totally immersed in highly putrid matter, we may fairly conclude, that a partial application of putrescent particles to teeth still enjoying life and connected with the rest of the body, will not be apt to hurt them: For we know, that in other parts of the body, the vital principle has a considerable effect in resisting putrefaction; and there is no reason to doubt of the teeth being endowed with the same power of self-preservation. But, besides this general argument in support of the opinion, I may remark, that if the common idea on this point was well founded, those parts of the teeth should be most liable to corruption where particles of food are most apt to lodge; while, on the contrary, those parts of them that are
not

not exposed to this, should seldom suffer. Now, every practitioner knows that this is by no means the case; for it must be acknowledged, that one part of a tooth is just as apt to become carious as another. The most likely part for food to rest in is between two teeth; and we allow that the teeth sometimes spoil in these parts, but by no means more frequently than in other parts, not so much exposed to this inconvenience.

It does not appear, therefore, that the causes which have been usually imagined to be most productive of carious teeth have much effect, nor do we know of any incidental occurrence from which, in particular, they can be supposed to proceed: From all the observation that I have been able to make, they seem rather to proceed from some general constitutional cause; from some tendency in the system to produce a wasting or decay of this particular part. The cause of this again I shall not pretend to explain; but I think it perhaps equally probable, that this mortification of
the

the teeth depends upon some general affection of the system, as that pain in gout originates from general cause or disposition: Instances no doubt occur, of teeth becoming carious evidently from some particular occasional cause, and especially from the enamel being injured by external violence: This, however, is not frequent: It is rarely indeed met with when compared with the frequency of carious teeth; a disease which in most instances begins without any evident cause, and which in general has subsisted for some time before being noticed.

But allowing that the opinion I have offered upon this point were admitted, it may be asked, To what purpose will it tend? Will it suggest any difference in the treatment of the disease? I think it will.—As the pain in toothach creates much impatience, and is with difficulty supported, if the pained tooth is carious, it is in general not only the desire of the patient, but the earnest advice of practitioners, to have it extracted, as being the
most

most certain means of obtaining relief. In violent degrees of toothach, when the other remedies usually employed do not succeed, extraction of the diseased tooth ought certainly to be advised; and in such circumstances no person can be more clearly of this opinion than I am; but I am equally clear, that, in common practice, this is carried too far, and that teeth are daily pulled which ought not to be touched. In most instances, the pain is no doubt removed immediately on the diseased tooth being removed; but it commonly happens, that relief obtained in this manner proves only temporary, and that the caries soon fixes upon some other tooth, which soon becomes as much diseased as the first; and this being likewise removed, the disease is apt to proceed from one to another, till scarcely any are left. Of this I have met with many instances, where almost the whole teeth have been successively taken out, one becoming carious soon after another was removed. Nor is there even at last any advantage gained

gained by the practice ; for, after all the teeth are taken out, the pain often remains equally severe in the jaw itself.

The frequent occurrence of this tends much to establish the opinion of carious teeth being often a constitutional disease ; and it likewise suggests the propriety of extracting teeth less frequently than is commonly advised. As we can never at first be certain whether toothach depends on a general cause or not, it is perhaps right in every case to extract the first, and even the second tooth that becomes diseased, as soon as the fits become frequent and severe ; But whenever the disposition is so strongly fixed in the system, that a third or a fourth soon become diseased, the patient should be advised rather to submit to a good deal of distress than to extract any more ; and it often happens, when he has resolution to submit to one fit of the toothach, and to wait till it is completely over, that he never afterwards, in this tooth at least, feels any return of it. Cases no doubt occur in which this
does

does not happen; but it happens often enough to warrant the propriety of giving it a fair trial in perhaps every instance: Even where it fails, no harm is done by the trial; and when it succeeds, the advantage gained by it is great. For a considerable time I adopted the common practice on this point in its full extent: Every carious tooth attended with pain I advised to be pulled; but finding in general that no advantage was derived from it, the result being for the most part nearly as I have already described, I was hence induced to depart from it; and now, after a patient has had a tooth or two extracted, if the disease still continues to return, I never advise the practice to be pushed farther, unless when the pain is so severe as to be unsupportable, which, however, is not often the case. By avoiding exposure to cold during the fit, and by exhibiting doses of laudanum proportioned to the degree of pain, the distress produced by it is at last in general removed; and by due attention to cleanliness, particularly by frequently

frequently washing the mouth with cold water, and, when practicable, by stuffing the opening in the carious tooth so as to prevent the access of air, many have been saved, not only from the pain and distress of pulling teeth that became first affected, but of losing others, which probably would have become carious if the common practice had been followed of extracting all diseased teeth as soon as they become painful.

Having thus endeavoured to show that carious teeth are most frequently produced by some general constitutional cause, I shall now proceed to consider more particularly the means to be employed, not only for preventing, but for removing toothach depending upon this cause.

In cases of carious teeth, it is the prevailing practice to remove the black or mortified spot with a file, in order to prevent it from spreading; but, so far as my observation goes, the practice ought not to be followed; for the diseased part of a tooth can never be removed without exposing

posing those parts that remain to a more free access of air than that to which they were previously liable ; and therefore instead of proving useful, I have almost universally seen it do harm. In many, I have known it induce pain where none existed before ; and instead of preserving teeth, it frequently seems to have the effect of rendering the remaining sound parts of teeth sooner carious than they might have become if they had not been touched. I therefore do not hesitate to say, that this practice of filing should be exploded ; and whoever considers the necessary effect of it, will probably be of the same opinion. It is evident that the part of a tooth already carious cannot be sensible of pain. For what purpose, therefore, should it be removed ? While it remains, it serves in some degree to cover and protect the sound parts beneath ; while by taking it off, they are left perfectly bare, and apt to be hurt by whatever is taken into the mouth.

When

When, again, as much of the enamel is removed, either by caries or external violence, as to form a cavity in a tooth, we have it frequently in our power to prevent the accession of toothach, by stuffing or stopping up the opening, so as to prevent the air and particles of food from getting access to the nerve. Different substances are employed for this: Such as gum lac, mastich, olibanum, bees-wax, sealing-wax, tin, lead, and gold. When the opening made by the disease is large, and especially when narrow at the bottom, and wider outwardly, mastich and gum lac, or even bees-wax, will sometimes answer, when none of the harder substances will remain in the cavity: But all of these being soft or friable, they are quickly rubbed down in mastication, and require to be frequently renewed; so that some of the metals are preferable when the form of the opening admits of their being employed, which is always the case when the tooth is much scooped out inwardly, with a small hole leading into

it. Gold leaf is sometimes used ; but nothing answers so well as common tin-foil. As much of it should be cut off as will probably be needed ; and one end of it being pushed into the hollow of the tooth with the instruments, fig. 6. 7. or 8. Plate XLV., the rest of it should be gradually pressed in till the cavity is filled ; and this being done, any portion of the tin that remains should be cut off, and the surface of the whole made smooth by frequent rubbing with the burnisher, fig. 9. of the same Plate. But before any attempt is made for stopping a tooth, the nerve should be rendered quite insensible ; for till this is done, the patient will not be able to bear the pressure which fixing the tin requires. In general the nerve becomes sufficiently callous, merely by delay : But when this does not answer, we may often effect our intention by inserting daily into the cavity of the tooth a few drops of oil of origanum, thyme, or any other essential oil ; by which any slight degree of irritability in the nerve is

is often removed, so as to admit of pressure being applied to it with freedom.

I have already observed, that neither tin, lead, nor any hard substance, will remain in the hollow of a tooth unless the opening into it is narrow. It has however been proposed, when the opening is of a different form, and when the stuffing cannot be fixed in any other manner, to do it by drilling a small hole through the sides of the tooth; so that when the lead is pressed down, it may be retained by passing a peg of silver, gold or any other metal, from one side of the tooth to the other. In a few cases this may succeed; but it will not answer either where the opening is wide outwardly, or where the sides of the tooth are not firm, as in such circumstances is often the case; for where the external opening is wide, even a peg passed through the centre of the stuffing will not keep it sufficiently firm to prevent some parts of the food from finding access to the parts beneath; and, when the remaining part of the tooth is

thin and brittle, it will be apt to break in making the hole.

When, however, by any of the means that I have mentioned, the hollow of a tooth can be properly stopped, it will not only prove the most effectual method of preventing frequent returns of toothach, but will have some influence in preserving the remaining part of the tooth. I have known various instances of this where carious teeth have been preserved for a great number of years, without being productive either of pain or any other inconvenience; but this requires the cavity to be completely stopped, so as to prevent either food, drink, or even air, from finding access.

When a person with carious teeth has been liable to frequent fits of toothach, besides stuffing the hollow teeth in the manner I have mentioned, he should attentively avoid exposure to cold: His head should be kept warm with flannel coverings through the night; and he should live in a dry situation. Indeed, a
moist

moist atmosphere proves so destructive to the teeth, that people living in wet situations find it exceedingly difficult to preserve them; and I have known various instances of frequent returns of toothach being prevented entirely, by the removal of the patient from a damp to a dry situation: Nay this will sometimes succeed when every other means have failed.

By due attention to these means, much may be done in preventing people with carious teeth from suffering so much as they otherwise would do: But, notwithstanding of all our endeavours, teeth in this situation are very apt to become painful, and are often productive of much misery; so that the most effectual method of lessening or removing this is often a very important object.

Some varieties of toothach may be removed by remedies applied to other parts of the body. Thus when pain occurs in a tooth, as it sometimes does, from inflammation first beginning in the ear, it may be more effectually removed by ap-

plying a blister behind the ear than by any other means : Or when a foulness of the stomach is the cause of it, an emetic proves the most effectual remedy. This I shall afterwards consider more particularly ; but when toothach proceeds from the nerve of a tooth being laid bare, it will seldom happen that any remedy will answer that is not applied directly to the part itself. Bark, electricity, and a variety of nostrums, are frequently employed ; but in this variety of toothach, the only remedies that I have ever known prove useful, are, anodynes, corrosive applications, and extraction of the tooth.

In slight degrees of toothach, the pain is sometimes relieved, or even altogether removed, by applying either opium or laudanum directly to the bare nerve : I have known camphor too prove useful, both by itself and when conjoined with opium ; and it sometimes answers in a liquid form, dissolved in spirit of wine, when it does not succeed in any other way : Æther may be likewise mentioned

as a remedy in toothach; but as these and other applications of a milder nature do not commonly succeed, we are for the most part obliged to employ others of a more active kind, with a view to destroy the nerve entirely.

A long continued use of any of the strong essential oils will in some cases, as I have already observed, render the nerve callous or somewhat insensible, but they never destroy it so entirely, as to prevent the risk of future returns of toothach. This, however, may be done by remedies of a different kind; by spirit of vitriol or any other concentrated mineral acid; by inserting a bit of lunar caustic into the cavity of the tooth; or by burning the nerve with the actual cautery. But, in using either the lunar caustic or any of the strong acids, much attention is necessary to prevent the contiguous parts from being hurt; for if not inserted with much caution, they are apt to spread and do much harm: The actual cautery may, however, be employed without risk: But

that it may prove effectual, the hot iron must be pushed farther into the hollow of the tooth than patients in general will allow; for if the nerve be not destroyed to the very extremity of the root, no advantage will be gained; and this being both tedious and painful, we meet with few that agree to it; but when properly applied, we have it in our power entirely to destroy the nerve: It may be done with a piece of small wire made sharp at the point, or with the instrument represented in Plate XLV. fig. 8.

It often happens, however, that none of these remedies answer, either from their not being duly applied, or from practitioners not pushing them so far as they ought to do. In this case, when the pain continues violent, we are under the necessity of destroying the nerve in a different manner, namely, by the extraction of the tooth; and this being done, if the tooth is not much spoiled, and if it be not broken in the operation, after the socket is cleared of blood, it may be replaced in
the

the manner I shall afterwards mention when treating of the method of transplanting teeth. This will not always succeed, especially in the molares; but in the back part of the mouth it is not so necessary as when the incisores or canine teeth are taken out, when it often answers. And when a tooth thus replaced becomes firm, it proves equally useful as before; while, from the total destruction of the nerve, it is not afterwards apt to produce pain. I shall now proceed to consider the method of extracting teeth.

The pulling of teeth being a frequent operation, much pains has been taken to perform it with as much ease as possible; and although it still necessarily gives pain, it is now done both with more ease and safety than it could possibly be in former times, while the instruments employed for it were rude and imperfect.

It is evident that a tooth may be pulled in different directions: It may either be pulled in a perpendicular direction with respect to its roots; or it may be made to
turn

turn upon its axis by depressing the corona or upper part of it, by which the point of the root will be proportionally raised; or a sufficient degree of force may be applied for pushing it out of the socket in a lateral direction.

If these methods of operating were all equally practicable, we would not hesitate to fix the preference: In raising a tooth perpendicularly, much less violence must be done to the contiguous parts than by forcing it out in a lateral direction: For as the roots of the teeth are all firmly fixed in bone, they cannot possibly be pressed out laterally, but with such a force as is sufficient for breaking or bursting open that part of the alveolar process of the jaw-bone with which they are surrounded; and as this must produce both laceration and contusion of the gums, it is necessarily productive of much pain: But as all the space we can obtain, even by the greatest wideness of the mouth, will not admit proper instruments for moving the teeth in the back part of the mouth in a
perpendicular

perpendicular direction, we are for the most part under the necessity of using such as move them laterally. All the incisores and canine teeth may indeed be taken out in a perpendicular direction, and even some of the molares, when they are loose; but when the molares are firmly fixed, no instruments with which we are acquainted will pull them in this manner. Various propofals have been made for this purpose; but although hitherto every attempt has failed, some farther trials may perhaps render our instruments sufficiently perfect for effecting it.

The only instruments of which practitioners in former times were possessed for the extraction of teeth, were different kinds of forceps or tenets, named according to their form, Hawks-bills, Cranes-bills, &c., and different kinds of levers both straight and crooked. These, however, were rudely constructed, and it was with much difficulty that teeth firmly fixed were moved by them. In process of time, therefore, various improvements
were

were proposed on them; but few of these being of much importance, it is not necessary either to describe them, or to give delineations of them; especially as they may be seen in the works of Garengeot, Scultetus, Hildanus, and other writers of the 17th and preceding centuries. All that I mean to do, is to delineate those instruments that are approved of by modern practitioners of reputation; to propose such improvements upon these as by experience have been found to prove useful; and to give a detail of the method of using them.

For a long time past, an instrument termed a Key has been almost the only one employed in Britain for extracting firm teeth, and it is now very generally used in different parts of the Continent. Different forms of it are delineated in Plates XLVI. and LI.

In operating with this instrument, if the tooth to be taken out is in the under jaw, the patient should be seated in a chair, while his head should be supported

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ed by an assistant behind ; but if in the upper jaw, he should be seated upon a pillow, with his head turned back, and supported upon the knees of the operator, who in this case must stand or sit behind him, whether the tooth be in the right or left side of the jaw : But when a tooth is to be extracted from the under jaw, if it is on the right side, the operator should be placed somewhat to the left ; and, vice versa, when the tooth is on the left side, the surgeon should place himself somewhat to the opposite side. That the instrument may be applied with as much freedom as possible, as well as to prevent the gums from being lacerated, all the soft parts adhering to the teeth should be separated, by insinuating between them the point of the scarificator, fig. 1. Plate XXXVII. ; and this being done, the operator must proceed to the application and use of the key.

The patient having cleared his mouth of blood produced by separating the gums from the tooth, the point of the claw, Plate XLVI. fig. 1. must be pressed as far
down

down between the gum and root of the tooth as possible ; and in this situation it must be firmly fixed and retained with the fore-finger of the left-hand, while the fulcrum C, being placed as far down as it will go upon the gums on the opposite side of the tooth, the operator must now with his right-hand apply such force as may be sufficient to move it ; and by turning the handle firmly round, almost any tooth may be taken out at one pull without raising the instrument : But whenever a tooth proves to be firmly fixed, and especially if it is one of the large molares whose roots diverge considerably, it is better, after it is freely loosened, to remove the instrument ; and having turned the claw to the opposite side, to apply it so as to turn the tooth to the other side of the jaw, by which it will be made so completely loose as to be easily taken out with common teeth forceps, Plate XLVIII. fig. 3.

In using the key, when the tooth to be taken out is firmly fixed, especially when
there

there is no vacant space between it and the contiguous teeth, some care is necessary to prevent these last from being loosened. When it cannot be done in any other manner, the edges of the tooth to be removed, should be filed down with a thin file, and it may be done without hurting the neighbouring teeth, by using a file that is smooth or polished on one side.

This I believe to be the best method hitherto known of extracting firm teeth from the back part of either of the jaws; and the incisores and canine teeth may likewise be pulled in the same manner: But these, namely, all the fore-teeth, as well as loose teeth in every part of the jaw, may be pulled in a different manner, which I shall afterwards describe.

Although there is some difference of strength, as I have already observed, between the outer and inner plates of the alveoli of the teeth, the difference is so trifling, that in pulling a tooth it merits little consideration. Neither does the direction of the roots of teeth deserve attention in this operation: For although it is
alleged

alleged by some, that they may be turned with most ease towards the inside of the mouth, from their roots being supposed to spread towards the outside of the jaw ; yet this is by no means the case. For the most part, the roots of the large molares diverge equally towards both sides of the jaw ; so that in this respect they may be pulled with the same propriety to the one side as to the other. But the two last molares of the lower jaw afford an exception to this ; for they are so situated, that in every instance where the common key is employed, they should be turned inwards. The basis or origin of the coronoid process forms a strong sharp ridge on the outside of the jaw, exactly opposite to the roots of these teeth ; so that, when turned outwards, as the heel of the instrument must rest upon this ridge, the gums which cover it are necessarily much bruised. When a tooth is much spoiled on one side, it is almost the universal practice in pulling it, to fix the point of the claw on the sound side ; and this being considered as
necessary,

necessary, may be given as a reason for our being obliged in some instances to turn even one of these teeth towards the outside of the jaw. This, however, is not on experience found to be the case; for, in general, it is supposed to answer best to fix the claw of the instrument on the soundest side of a tooth, and to turn it to the opposite side; yet with due pains and attention, we might perhaps in every instance follow the very reverse of this with equal success: For with a proper application of the scarificator, we may almost always separate the gums, so as to be able to press the point of the claw far enough down upon the root, and in this manner to turn it with ease to the opposite side.

The key-instrument, however, may be made so as to turn even the two farthest molares outward, without doing any injury to the gums lying above the process that I have mentioned. A form of it for this purpose is delineated in Plate XLVI. fig. 3. which I proposed several years ago, and which I have often used. By the

heel of the instrument resting upon the gums beneath the first great molares, while the claw is bent in such a manner as to apply to either of the two posterior teeth, they may in this manner be turned out with safety. The heel should be made long, so as to pass far down upon the gum; otherwise, for this particular purpose, it will not answer so well. Indeed the heel of the key-instrument should be always longer than it is usually made; for when short, it acts with much less power, and is more apt to break the tooth, than when made of a greater length. The contrary of this I know has been much inculcated; but after giving a fair trial to both methods, I am now convinced that the key with a long heel is much preferable to the other. The chief objection to the use of a long heel is, that it must bruise the gum more than a short one. This, however, is not the case, as will be readily allowed by all who attentively think of it; for even the shortest heel must press upon some part of the gum; otherwise, if applied upon the
tooth

tooth itself directly opposite to the point of the claw, as some have advised, it will act in nearly the same manner, and with no farther power than common forceps: While, again, a long heel, does not, as is commonly imagined, injure the gums in proportion to its length; for although the flat side of it is applied to the gums at first, as soon as it begins to act, the farthest point of it only will be found to touch them; and accordingly this part of the heel, as well as all the rest of it, should be made as smooth as possible; so that in turning upon the gum, it will do less harm than when of a rough surface according to the usual form.

I have already observed, that in pulling teeth, the side to which they are turned need not be much regarded, from any difference of strength between the outer and inner plates of the alveoli or sockets; for in this respect they are nearly similar. But even although the difference was more than it really is, it would not merit attention; for, in pulling teeth in the man-

ner I have described, namely in an oblique or lateral direction, it is evident that the sockets must be broken on both sides ; at least this must be always the case where the roots of a tooth are of the usual length, and not shortened, as they sometimes are by disease ; for while the corona of a tooth is forced down upon one side of the socket, the point of the root must necessarily be turned in nearly the same proportion upon the other. The softer parts will not indeed suffer so much, as they will not be bruised by the heel of the instrument ; but the socket must obviously be much hurt by it ; so that, in every point of view, little or no consideration is due in this operation to any supposed difference between the strength of the two plates of which the sockets of the teeth are formed.

But as it is of much importance to save both sides of the alveoli as far as possible, nothing should be omitted that can with propriety be done for their protection. For this purpose, a form of the key-instrument
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has been proposed, for supporting the gums and alveoli, while the tooth is raised and separated from them by turning the instrument in the usual manner. But if the socket is supported, and not allowed to yield on the tooth being pressed towards it, there is much reason to fear that the tooth itself would break; and if the instrument be not applied in such a manner as to have this effect, it will answer no other purpose than the key in common use; while, being more complex, it is managed with more difficulty. The proposal, however, is ingenious, and may lead to improvement in the operation of tooth-drawing*.

In pulling a tooth with the key-instrument, it is the common practice to force it out at once. But although this may sometimes succeed, it ought not to be tried; for when the roots of teeth diverge much, or when any portion of the fang is

C 3 enlarged,

* This instrument is the invention of Dr John Aitken. For a more particular account of it, see *Essays on several important subjects in Surgery.*

enlarged, as is sometimes the case, we run much risk, by this method, of breaking them, at the same time that the socket must be much more injured than when the tooth is loosened in the manner I have advised, by turning it first to one side and then to the other with the key-instrument, so as to be able afterwards to take it out with common forceps. And if this is done slowly, with a gradual equal pressure, and if the heel of the key has been properly covered with several plies of soft linen, scarcely any harm can be done by it : But instead of this, when the instrument is applied directly to the gum, without the intervention of any soft substance, and the tooth turned out, as is frequently done, by a sudden jerk, the gums are not only greatly bruised and lacerated, but the socket is more severely injured, at the same time that the tooth itself is under a greater risk of being broken than when pulled in a more gradual manner. It is natural for patients, ignorant of the risk attending it, to wish for the operation to be quickly done ;

done ; but it is unpardonable in practitioners to indulge them in this, when a moment's reflection must convince them, that a tooth cannot be quickly pulled but with much risk, either of the jaw or it being broken.

Even when the operation is done in the most cautious manner, troublesome accidents sometimes ensue from it : And these particularly are, contusions of the gums ; splinters of bone being separated from the jaw ; and alarming hæmorrhagies.

Laceration and contusion of the gum being a very painful part of the operation, we ought, as far as possible, to guard against it ; not merely by covering the heel of the instrument in the manner I have advised, but by declining to use it while the gums are much inflamed ; for while much inflammation continues, the operation necessarily gives much more pain than it otherwise would do. For obviating the effects of laceration, when any portion of gum is much separated from the rest, it should be cut off with

scissars; the mouth should be fomented from time to time with warm milk, or any emollient decoction; and when there is cause to imagine that suppuration will take place, it should be encouraged by the application of roasted figs or onions, by way of cataplasm. In this manner, if an abscess occurs, it will be soon brought to maturation; when, if it does not burst quickly, it ought to be opened: And again, in slighter contusions, nothing alleviates the pain induced by them so effectually as the applications I have mentioned.

When the socket only has suffered, little or no harm ensues from it; so that it is seldom necessary to mention it even to the patient. But when the splinter extends to the more solid part of the jaw, which in children especially is apt to happen if the operation is not done with the utmost attention, as the sore that ensues proves commonly tedious, and does not readily heal as long as any loose pieces of bone remain in it, any of these
that

that are perfectly detached should immediately be taken away ; but as they are seldom so completely separated as to come easily away at first, no force should be used in it, as they afterwards either fall out of themselves, or may be easily taken away on a free formation of matter taking place. After this, if the matter is prevented from lodging, and if the constitution is in other respects sound, the sore usually heals with ease.

Hemorrhagies of importance are not frequently produced by tooth-drawing ; for the bloodvessels of the teeth being small, it is scarcely possible that they can discharge much blood. But when the roots of teeth are deeply fixed in the jaw, and when much force has been used in the operation, we can easily suppose that in this manner some of the larger arteries of the contiguous parts may be divided ; and it is thus I imagine that any troublesome hemorrhagy is ever produced by this operation. At first we advise the patient to take frequent mouthfuls of cold
water,

water, red wine, brandy, vinegar, or even alcohol; and for the most part one or other of these prove successful; but when they happen to fail, other means must be employed, and the most powerful of these is compression. A doffel of soft lint, fitted to the opening, must be pushed into it; and the patient being desired to compress it, by keeping his mouth shut, if this is properly done, it does not commonly fail. I have met with instances, however, even of this proving unsuccessful, and of fainting and other distressful symptoms being produced by the hemorrhagy. In this situation the actual cautery is alone to be trusted; and it must be applied with freedom, otherwise no advantage ensues from it. A small bit of lunar caustic inserted into the opening might answer; but it does not act with such certainty as the other, while there is more risk of its doing harm, from its being apt to spread so as to injure the contiguous parts.

The key-instrument is perhaps the best hitherto invented for the pulling of teeth
in

in an oblique or lateral direction ; but we have several others that act nearly on the same principles : These, however, being less perfect, I shall not delineate them all here ; but with a view to convey some idea of them to such as may not have other opportunities of seeing them, I have given a representation of two of them in Plate XLVII. figs. 2. and 3. But even these, although the best with which I have met, are far inferior to the key : For they act with much less power ; and they have this material defect, that they can never be employed for pulling teeth towards the inside of the mouth.

I have thus described the method of extracting firm teeth from the back part of the mouth. Any of the fore-teeth may likewise be pulled, as I have already observed, with the same instruments ; for they may be turned either inwards or outwards, by a proper application of the key : But they may also be pulled in a different method ; and as this may be done with instruments that do not bruise the gums, they

they should perhaps in every instance be pulled in this manner.

The incisores and canine teeth, and even the two small molares have only one root ; so that they are never so firmly fixed in the jaw as the large grinders ; and they may be extracted with more ease. For the most part this may be done with the common teeth-forceps represented in Plate XLVIII. figs. 1. 3. or 4. In using this instrument, it should be pressed as far down upon the tooth as possible, otherwise it is apt to break off the corona or upper part of it, and to leave the root ; and the tooth should not be pulled directly upwards, but twisted alternately from one side to the other till it becomes loose, when it may be taken out without further trouble.

In some cases, however, even the fore-teeth are too firmly fixed to admit of being pulled with this instrument : I have therefore given a representation of forceps that act with more power ; a very ingenious invention first made public in the
British

British Magazine in the year 1762. It is delineated in Plate XLIX. figs. 1. and 2. Fig. 1. represents a common strong forceps with moveable claws. The axis of the claws is shown at *A*. Fig. 2. is a fulcrum. *B, C*, is the handle going off obliquely from *B*, by which it is more easily applied. *B, F, D*, is a plate of iron covered underneath with a piece of soft buff; and *E* is the other side of the same plate made round, smooth, and uncovered. The tooth intended to be pulled is laid fast hold of with the forceps, fig. 1.; then the fulcrum *B, F, D*, is placed upon the neighbouring teeth, when the forceps being placed upon the round part of the plate *E*, by a proper motion of the lever *G, H, I, K*, the tooth is in this manner extracted. In the pulling of loose teeth, this instrument may be used so as to draw them nearly straight up; and this we are told may even be done where the teeth are firm, provided their roots do not diverge much, and that there are no osseous adhesions between them and the sockets: But with a view to prevent

vent any bad consequences that might ensue from the application of much force, we are desired by the anonymous author of the instrument, instead of attempting to pull firm teeth directly upwards, to twist them outwards, which loosens them so much, that they may then be pulled in a perpendicular direction with much ease.

The advantage supposed to be derived from forceps with moveable claws is this: When common forceps is used with immoveable claws, if the tooth is firm, it must either be forced out obliquely, or the first hold must be lost, and the instrument fixed again: But when the claws are moveable, the instrument retains its hold, so that the tooth may be pulled nearly in a perpendicular direction; for the claws, by turning upon centres, will always fall into the way of the tooth; and will therefore raise it nearly in a straight line.

I have taken different opportunities of observing, that the most painful part of tooth-drawing arises from the bruising
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and laceration of the gums and sockets ; a circumstance that cannot be altogether avoided when the key-instrument is employed. The great object of the forceps that I have just described being to pull in a straight direction, by which the gums and sockets are almost entirely saved, would render it the most complete instrument that hitherto has appeared, were it not liable to some very important objections. The ingenious author of this forceps thinks it may be employed for the extraction of any teeth ; even of the large molares ; but as the mouth cannot be so widely opened as to admit of our applying it properly, this attempt should not be made with it : It must therefore be confined, as I have observed already, to the pulling of teeth in the fore part of the mouth. But besides this, as the fulcrum is placed upon the contiguous teeth, when the tooth to be pulled is firmly fixed, it is scarcely possible to prevent these from being hurt : For they will be very apt to suffer even when the pressure is made as
nearly

nearly as possible in the direction of their roots; and when this is not done with accuracy, they are apt to be broken, or even forced entirely from their sockets. In the pulling of loose teeth, however, and whenever the fore-teeth are not so firmly fixed as to require much force to move them, this instrument may be employed with advantage. When, again, it is discovered upon trial, that an unusual degree of force is necessary, a prudent practitioner will rather lay the forceps aside, and finish the operation with some other instrument. The common key, as I have already observed, may be used; or either of the instruments, fig. 1. and 2. Plate XLVII. may be employed for loosening the tooth; after which it may be taken out either with these or with common forceps.

I have hitherto been supposing that the tooth to be pulled is only carious in a particular part, and that a considerable part of the corona is still remaining. When a tooth becomes so much diseased
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that the upper part of it falls entirely off, so as to leave little or nothing above the gums, the remaining part of it is thus reduced to what is commonly termed a Stump.

In this stage of the disease, the connection between the roots that remain and the sockets, undergoes a very important change. By the corona being removed, the roots, whatever number there may be, are all separated from each other; for being united solely through the intervention of the corona, their connection must evidently be destroyed on this being taken away. In this manner their connection with the sockets becomes less firm, than when diverging roots, tied together above, tend all to support each other; but they become still more loose by a dissolving or wasting process, to which teeth in this situation are always liable. A considerable part of the corona of a tooth may become carious, and fall away, without the roots being affected; but I have scarcely known an instance of the corona

being completely removed for any length of time, where the roots did not suffer a remarkable diminution. Nay, in some cases, the roots, even of the largest molares, have been almost completely annihilated; and instead of the long fangs with which these teeth in a state of health are furnished, only a small point or two of spoiled bone has been met with. In consequence of this they become loose; and their connection with the jaw being now very superficial, they may be forced out much more easily than a large tooth. I know that practitioners in general are not of this opinion, the pulling of a stump being for the most part considered as more difficult, as well as a more painful operation, than the extraction of a large tooth. This, however, can proceed only from want of experience in this branch of practice; for those who are more versant in it know, that there is much more pain, hazard, and difficulty, in the pulling of a complete tooth when firmly fixed, than in the taking out of several stumps.

When

When the point of the claw can be forced so far down upon a stump as to get a firm hold, it may be pulled with the key-instrument in the manner I have advised for the extraction of large teeth ; but this should not in general be done, as we may commonly employ a sufficient force with instruments that do not injure the gums, and by which a very painful part of the operation may be avoided. When the stump can be laid hold of, either with common forceps, or with those with moveable points, this, as the easiest method, should be preferred : But when so much spoiled, as to be nearly, or perhaps entirely, covered with the gums, the points of forceps cannot be pressed sufficiently down upon it ; in which case, we are under the necessity of forcing it out with a simple lever. This instrument is commonly termed a Punch ; of which different forms are represented in Plate L. figs. 1. 2. and 3. In using it, the gums must be freely separated from the stump with a scarificator ; and the point of it being

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pressed down upon the root, a degree of force must be applied with it, sufficient for raising the root from the socket; and this being done with one of the fangs, the instrument must, in a similar manner, be applied to the others.

With those accustomed to the use of the punch, this operation is simple and easy, while with others it proves both tedious and difficult. With a view to apply as much force as possible, the point of the instrument is commonly pushed as far as it will go towards the root of the fang: But by this means much of the force is lost against the alveoli of the opposite side; which being firmer and stronger towards the base of the jaw, do not so readily yield at this part as where they are thinner and not so firmly supported. It answers better to push the instrument no farther down upon the fang than is merely necessary for procuring a sufficient rest for the point of it; for I know from experience, that a stump may be forced out in this way with more ease
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than in any other manner. When the punch does not force it out entirely, but serves merely to loosen it, it may in this state be laid hold of with the forceps, and removed in the manner I have pointed out.

For the most part, a punch of the form represented in Plate L. fig. 1. answers best. With this the force is applied so as to push the fang towards the opposite side of the jaw; but it sometimes happens, that the upper point of the root is of such a form as does not readily admit of force being applied to it in this direction; in this case we employ a kind of hook or crooked lever, such as is represented in fig. 3. by which the stump is drawn or raised in a contrary direction.

I have thus described what, by experience, I have found to be the surest and easiest method of extracting teeth. A variety of instruments may indeed be met with in other authors, which I have not mentioned, and by which, it is said, by their inventors, that the operation may

be done with more ease. But this not being supported by the result of practice and observation, it will not be expected that I should give any account of them.

§ 2. *Of Toothach from Inflammation.*

THE ordinary symptoms of toothach arise, for the most part, as I have already remarked, from the nerve being laid bare, either from a tooth becoming carious, or from the enamel being broken by external violence. It sometimes happens, however, in a very violent manner, merely from an inflamed state of the membrane surrounding the root of a tooth, or from the parts within the body of the tooth becoming inflamed. We judge of this being the cause of toothach, when a severe permanent pain attacks a tooth that outwardly appears to be sound: And this especially when it has been evidently induced

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ced by much exposure to cold, or when it is connected with other symptoms of inflammation, such as an inflamed state of the contiguous cheek, or swelling and suppuration in the adjoining gums.

In most instances, we may be able to trace this variety of toothach to this cause, namely, exposure to cold; in some cases, however, it proceeds from causes of a different nature. Whatever excites inflammation in other parts of the body, will produce the same effect when applied to the membrane that surrounds the root of a tooth: And we know from experience, that inflammation of this membrane is sometimes induced by a disease to which the roots of the teeth are liable; what is termed the Swelling of the Fang, a hard knot or exostosis that sometimes forms at the point of the root. At first, the pain induced by this may be supposed to originate altogether from distention; but ultimately it commonly terminates in a very severe degree of inflammation. And inflammation of these parts, by whatever

cause it may be induced, is always attended with more violent pain than what commonly takes place from similar affections in other parts, owing to their being here surrounded with bone, which prevents them from yielding so readily to that distention of the vessels that always occurs in inflammation.

In the treatment of this variety of tooth-ach, we find, in general that those remedies prove most useful which answer best in inflammatory diseases of other parts. Local blood-letting, either by scarifying the gums with a lancet, or by the application of leeches, often gives relief. I have known the pain removed by the application of a blister to the contiguous part of the cheek; and much advantage is often derived from a large dose of laudanum: by procuring a temporary diminution of pain, it thus lessens irritation, and hence an abatement of the inflammation itself. The head should be kept warm with coverings of flannel; a practice that should be inculcated with all
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who are liable to toothach, from whatever cause it may proceed, but particularly when it originates from inflammation; and in this case, fomenting the head with the steams of emollient herbs, or even of warm water alone, will often procure relief when every other remedy has failed. In some cases, indeed, cold water, vinegar, or ardent spirits taken into the mouth, prove serviceable; but for the most part, warm applications prove more useful in this variety of toothach.

By duly persevering in the use of one or other of these remedies, the pain will commonly be at last removed; and in toothach arising from inflammation, we are particularly induced to give them a full trial, from our knowing that the disease is not apt to return, after being once removed. But, when other means do not succeed, we are under the necessity of advising the tooth to be extracted, the only remedy in such circumstances, on which we can depend. In extracting a firm tooth, I have already advised it to be done in a
flow

slow gradual manner, with a view to prevent it from breaking, and the jaw from suffering so much as it is apt to do when a tooth is forced quickly out. This caution, however, is more especially necessary in the extraction of teeth under the circumstances we are now considering; for, when the pain originates from inflammation alone, without any part of the tooth being spoiled, the roots are always entire, and more firmly fixed than when the corona of a tooth is mostly consumed, and when the roots, therefore, are commonly in some degree decayed. And besides, when pain and inflammation are induced, as I have already remarked, by swelling or enlargement of the fang, and which can never be previously discovered, if the tooth be turned quickly round it will for certain break; and the swelled part of it being left behind, scarcely any advantage will be derived from the operation, while all the pain and distress which it usually excites will be severely felt by the patient.

On

On pulling a tooth that is not in any part carious, we are advised by some practitioners to replace it, and to tie it to the contiguous teeth, till it becomes firm. This I have done in different instances; but I think it right to observe, that it often fails, owing, I presume, to the experiment being most frequently tried with teeth in a state of inflammation. I know that it often answers where no symptoms of inflammation have taken place; but whenever the membrane surrounding the roots of teeth, or even when the contiguous parts only are much inflamed, it will seldom or never succeed, while, at the same time, the trial will always excite much pain and distress. It ought not, therefore, to be advised indiscriminately in every case, as has frequently been done.

§ 3. *Of Toothach arising from Affections of distant Parts.*

ALL the symptoms of toothach sometimes take place in one, two; or more teeth, where even with the most accurate examination we cannot discover the least appearance of disease; where we are therefore certain that no part of them is carious, and even where it is obvious, that the disease does not originate from inflammation.

In such circumstances, as the patient is at first always unwilling to part with a tooth that appears to be sound, all the remedies usually employed in toothach are made use of; such as blisters,—blood-letting with leeches,—the application of ardent spirits and strong essential oils to the pained part; and after being for some days tormented with these, with little or no advantage, the pulling of the tooth is recommended as a remedy that does not fail.

fail. Even this severe alternative is at last agreed to; but unfortunately with no benefit. The tooth in which the pain seems to be most severe is first taken out; but the contiguous teeth becoming soon pained in an equal degree, they are from time to time taken out, till at last I have known all the teeth of one side of a jaw extracted, and still the pain continue equally severe in the gums as at first.

In such circumstances, we often find, that the pain in the tooth is induced by an affection of some other part, and that no remedy will answer that is not directed to the original disease. It originates in some instances from rheumatism;—it has been known to proceed from an arthritic diathesis;—it occurs as a frequent symptom in hysterical affections;—pregnant women are frequently distressed with it;—and in some cases it obviously proceeds from a foul state of the stomach.

When the pain originates from a foul stomach, which may be often known by the state of the tongue, as well as other circumstances,

circumstances, no remedy proves so useful as an emetic. I have known the most violent toothach, which for many weeks had resisted the effects of every other remedy, almost instantaneously removed by an emetic; and when the stomach is sufficiently cleared, a plentiful exhibition of Peruvian bark will often prevent a return of it; particularly where the fits of toothach have returned periodically, as they sometimes do so regularly as to give cause to imagine that they depend on a tendency to ague.

In this variety of toothach, arising from an affection of the stomach, no benefit is derived from laudanum. Instead of procuring ease, it seems rather to increase the pain, and, by inducing sickness, to render the patient in every respect worse. But in those varieties of the disease, which originate from rheumatism, gout, or hysterical affections, opiates will for the most part remove the pain entirely: And a return of it may be frequently prevented merely by keeping the parts sufficiently

sufficiently warm. In hysterical patients, a combination of laudanum with ether has sometimes proved useful, when opiates in every other form have failed.

Opiates are often used in toothach induced by pregnancy; but seldom with advantage. In large doses indeed they sometimes procure a short relief from pain; but nothing I have tried answers with such certainty as blood-letting. A plentiful discharge of blood, by the application of leeches to the neighbouring gums, will sometimes answer the purpose; but as the pain seems here to originate from a general plethoric state of the system, it commonly proves more effectual to empty the vessels by taking away ten or twelve ounces of blood from the arm. I have known women immediately relieved by blood-letting, who for several weeks had been liable to very violent degrees of toothach, and in whom neither tooth-drawing, opiates, blisters, nor any other remedy, were productive of any advantage.

When

When a practitioner finds that he has pulled a tooth in the circumstances we are now describing, where there is neither inflammation nor much caries, he may with much propriety replace it. After clearing the tooth and socket entirely of blood, it should be put as nearly as possible into its natural situation; where it should be tied to the two contiguous teeth till it becomes firm.

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SECTION X.

Of TRANSPLANTING TEETH.

THE advantages of a sound set of teeth, both with respect to beauty and utility, are evidently great: We are not therefore surpris'd at finding the fertile genius of modern artists employed in endeavouring to supply the loss of those teeth which accident or disease may have occasioned. The method of supplying these deficiencies, and even of making complete sets of teeth, has been long known, and the art has long been carried to great perfection; but the transplanting of human teeth from one living body to another is the invention of modern artists. The mere proposal of such a nice operation was entitled to much credit; and in no instance does the art of surgery appear to more advantage than in render-

ing the practice of it perfect. It will readily be conceived, however, that it is not admissible in every case. Various circumstances must concur to render it practicable; but it may commonly be done wherever it is necessary.

1. As it is in general more with a view to obviate deformity, than to be productive of any real advantage, that the transplanting of teeth is practised, it is seldom considered as necessary with any of the large molares. Indeed with these it could not often take place; for as the roots of them often diverge in a very uncertain manner, and as the number and length of the roots can never be previously determined, it would for the most part be impossible to procure teeth exactly fitted to the vacancies intended to be filled up. The practice is therefore confined almost entirely to the incisores and canine teeth, although it may be done with nearly an equal certainty in the small molares; for in them the roots are either single, or if
there

there are two fangs they are almost always united.

2. In order to ensure success, the alveoli and gums must be perfectly sound. They must be free from scurvy and the lues venerea; nor must the patient undergo this operation for a considerable time after a salivation. The use even of a small quantity of mercury frequently leaves such a soft spongy state of the gums, as renders it improper while it continues to attempt any operation upon them. Hence those who are to have teeth transplanted, should carefully avoid even the risk of contracting any complaint for the cure of which mercury may be necessary *. A patient being liable to gum boils has been considered as an objection to this operation; but where every other circumstance concurs to render it proper, it should not be forbid by this: For although it would not probably succeed where the

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* This caution is particularly inculcated by the late very ingenious Mr John Hunter, in his Treatise on the Diseases of the Teeth, page 98.

surrounding socket is carious; yet we know that gum boils often occur where the socket is not in any respect diseased.

3. As the success of the operation will depend in a great measure not only on a sound state of the alveoli, but on the sockets being full and complete, it will seldom answer where teeth have remained long in the state of stumps: For in this state the roots commonly waste away so as to lose much both of their length and thickness; and the alveoli diminishing in nearly the same proportion, sufficient space would not be left for fixing the roots of a sound tooth. The attempt, however, may be always made, where any considerable part of the corona of a tooth is left; for in this case the roots, as I have formerly remarked, are usually complete, however much the caries may in other respects have spread.

4. It is in youth and middle age only that this operation is admissible. In childhood and old age it should not be attempted. In childhood, a tooth put in,
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in this manner, would never become firm, as the approaching tooth of the second set would always be acting against it; and besides, as any vacancy produced at this period will be filled up when the second set comes forward, it can never be requisite. In old age again, two strong objections occur to it. At this period the sockets of the teeth are commonly much diminished, particularly in depth; and many of the smaller bloodvessels being now obliterated, it is not probable that any transplanted tooth would ever become firm: For, when the operation succeeds, as a firm union always takes place between the tooth and contiguous parts by means of bloodvessels passing from one to the other, we are led to imagine that it would not otherwise answer. Now this, for the reason that I have mentioned, can never happen in advanced periods of life.

5. The transplanted tooth ought to fit the socket as exactly as possible: But it should not require much force to insert

it ; for if in any degree too large, either in length or thickness, it will create much unnecessary pain ; the irritation produced by it will probably terminate in suppuration ; and in this manner the operation will be rendered abortive. Several people therefore should be provided for the purpose of furnishing teeth ; so that the operator may have no difficulty in finding one of a proper size : It will frequently happen, that a tooth of the same size taken from one person, will fit the socket of the same tooth in another person very exactly ; but when it is found, that the roots of the tooth newly pulled are either too long or too thick for the socket in which they are to be placed, they should be filed down till they go easily in ; for it is not found that the removal of a small part of the root prevents the success of the operation ; and care should be taken to make the surface of the transplanted tooth somewhat lower than the level of the contiguous teeth, so that no inconvenience may ensue from the tooth
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in the opposite jaw being pressed against it. This difference in length, however, need not be so considerable as to be very perceptible; for the smallest difference will answer the purpose, and a greater degree of it would produce deformity.

But although the roots of teeth to be transplanted may be lessened with a file, no part of the corona should be touched or injured. It is sometimes indeed done by dentists, and it may in some instances succeed; but as it must always be attended with some risk of the tooth becoming carious, it should never be advised; especially as, with due attention, it can never be necessary; for although we may be mistaken with respect to the size of the roots of a tooth, we have it always in our power to determine with accuracy, whether the upper part of the tooth to be pulled will fit the vacancy or not.

6. In taking out the new tooth and removing the old one, much care and attention is necessary; for if the new tooth is much broken, or if the socket in which

it is to be placed is much injured, the operation will not succeed. When it is possible therefore to take out the old tooth with the forceps, it is better to do it in this manner than with the key-instrument, which can scarcely be used without injuring the parts too much.

7. When the tooth is removed, the socket cleared of blood, and the new tooth inserted under the restrictions I have mentioned, we are next to endeavour to keep it firmly fixed till an adhesion sufficient for retaining it takes place between it and the neighbouring parts. This must be done by tying it to the two contiguous teeth, and by much attention on the part of the patient to do nothing to loosen it. In transplanting a canine tooth, the ligature, which should be made of several plies of fine silk properly waxed, should be first tied round the upper part of the new tooth, immediately above where it begins to swell; and on the tooth being properly placed, it should be tied to the two contiguous teeth, taking care to pass the ligature

gature as near as possible to the gums. But when an incisor or small molaris is transplanted, it answers better to fix the ligature first to the contiguous tooth near to the junction of the gums, and then to pass it over the surface of the new tooth, and bringing it again back, to fix it where it commenced, round the necks of the other teeth. In this manner the transplanted tooth is pulled down by the ligature into the socket; but much care is necessary to prevent it from being drawn too much either to one side or another; for nothing more certainly prevents our success than the new tooth being made to press upon either of the contiguous teeth. This, however, will never happen in the hands of an expert artist, who has been sufficiently accustomed to this branch of practice; nor can it happen with any who is duly warned of the consequences that may ensue from it.

When the ligatures are properly fixed, they may not perhaps need to be renewed; but when they either slip off accidentally,

dentally, or become loose, they should immediately be renewed; and the patient should be constantly on his guard to avoid whatever might in any degree loosen or shake the tooth. Nor is it sufficient to attend to this for a few days only: The same kind of caution must be continued till the tooth becomes firm; and the length of time necessary for this will depend on the circumstances of every case; on the particular state of the alveoli; on the age and habit of body of the patient; and on the operation being done with more or less accuracy: In some cases a tooth will become perfectly firm in the space of eight or ten days; while in others it will remain somewhat loose for two or three months. During all this period the patient should live as much as possible on spoon-meat, and should guard particularly against cold; for nothing renders the success of the operation more uncertain than exposure to cold or dampness.

The most important objection that has been started to the transplanting of teeth,
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is the risk with which it is attended of communicating diseases; and I must own that *à priori* it appears to be a very material one. It has not however been found on experience to be sufficient to counterbalance the advantages that individuals suppose they derive from it; for the operation is daily practised; and we seldom hear even of any suspicion of its having carried infection into the system. I am not, however, of opinion with those who think that diseases cannot be communicated in this manner. On the contrary, I think those practitioners do not deserve to be employed, who treat a matter of such importance to their patients with indifference. Teeth for the purpose of transplanting should never be taken from people with any appearance of disease. Those only should be used that are procured from constitutions in which there is every possible evidence of health; and with a view to prevent as much as it can be done, every risk of infection being conveyed, the tooth to be transplanted should
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be immersed for a few seconds in lukewarm water, and should afterwards be entirely cleared of any blood or matter that may adhere to it, by rubbing it between the plies of a piece of soft old linen.

There is reason indeed to imagine, from the result of some experiments made with a view to inoculate the measles, as well as some other diseases, with the blood of those infected with the disease, that infection cannot be communicated in this manner. But the point is by no means so certain as to warrant our placing much dependence upon it.

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SECTION XI.

Of the RANULA.

TUMORS of different degrees of consistence frequently form beneath the tongue, sometimes on one side, and at others on both sides, of the frenum; and in general they are distinguished by the term Ranula. They seldom give much pain; but in some instances they become large, so as even to impede the sucking of infants, and the mastication, and speech of adults. In such circumstances, the assistance of surgery becomes necessary.

In some cases, these tumors contain a fatty kind of matter: This, however, is rare; and for the most part, perhaps in nineteen cases of twenty, they are filled almost entirely with a thin limpid liquor, very much resembling saliva; and we find, on cutting into them, that they are often produced by a stoppage of the salivary ducts,

ducts, the effect of calculous concretions. They sometimes arrive at a large size; but in general the tumor bursts when of the size of a large nut, leaving an ulcer that proves difficult to heal, if the real cause of it is not discovered and removed. I have known this kind of ulcer treated with much attention for the space of several months,—various detergent and even corrosive applications employed for it,—nay, in one instance a long mercurial course was administered, but with no advantage whatever; and, at last, on the true origin of the disease being discovered, it was cured in the space of a few days, merely by removing a portion of hard calcareous matter, which, by stopping the natural passage of the saliva, first produced the tumor, and afterwards prevented the ulcer, in which it terminated, from healing. In some instances these concretions are small, not larger perhaps than the head of a middle sized pin; whilst in others they are large. I have in different instances found them of the size of a kidney-bean.

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In all cases where the tumor is soft, our best practice is to lay it open with a scalpel from one end to the other ; by which any calcareous particles contained in it are easily discovered ; and these being removed, the remaining sore commonly heals easily. There is no necessity, however, for washing the sore, as we are generally advised to do, with tincture of bark and other astringents : On the contrary, warm water and other emollients answer better, by washing out more effectually any particles of stone that may not have been previously discovered. When indeed the sore proves afterwards difficult to heal, the others may sometimes be employed with advantage.

The same kind of treatment should be pursued in the treatment of old fistulous sores of these parts. In almost every case where the disease is seated in any of the salivary glands or ducts, it will appear to be kept up by the cause I have mentioned, namely, a stoppage of the duct by a particle of stone ; and the removal of this, by
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an incision, and turning it out with a probe or a scoop, will very commonly answer.

When, again, tumors in this situation are of a fatty or even of a firmer consistence, instead of cutting into them, they should be extirpated entirely; and unless they lie deep, and are of a large size, it may always be done with safety.

Practitioners are very properly indeed afraid of hemorrhagies in this situation; for as the arteries lie deep, it is always difficult, and most frequently impossible, to secure such of them with ligatures as happen to be cut. But wherever the tumor is loose, and not deeply attached to the contiguous parts, it may be taken out without any risk of hemorrhagies; for the superficial arteries being small, any discharge which they produce, in general, stops, by the application of oil of vitriol, duly diluted, — alcohol, — or tincture of myrrh. In more violent hemorrhagies, the potential or even actual cautery should be employed; but means of this kind are seldom necessary.

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In the removal of these tumors, where they lie so deep that they cannot be easily laid hold of with the fingers, small forceps are usually employed ; but a small hook with two fangs, such as is represented in Plate XXXVII. fig. 3. answers better.

SECTION XII.

*Of ULCERS of the MOUTH and TONGUE, and
EXTIRPATION of the TONGUE.*

THE tongue and other parts within the mouth are liable to all the variety of ulcers incident to other parts of the body; and the means of cure that are employed for them should be nearly similar. When they seem to proceed from lues venerea, scrofula, or scurvy, our views should be chiefly directed to the cure of the general disease of the system, while local remedies only should be employed, when they appear to be local.

Besides other causes of ulcers, however, to which these parts are liable, it is proper to observe, that there is one to which they are more particularly exposed, and which appears to give rise to the greatest part of them, namely, ragged teeth. I
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have known very troublesome sores, not only produced, but kept up for a great length of time, on the sides of the tongue, and on the insides of the cheeks, by the sharp points of broken or carious teeth; and as long as the rough part of a tooth, which has once induced a sore of this kind, is allowed to remain, no remedy whatever will heal the sore. In every case, therefore, of ulcer in the mouth, we should inquire with much attention into the state of the contiguous teeth; and when any of them are rough and pointed, they should be made as smooth as possible with one of the small files, Plate L. fig. 5. or 6. Or when the sore appears to be induced by tartar upon the teeth, it should be removed in the manner I have already advised in the eighth section of this chapter.

The removal of the cause is for the most part soon followed by a cure of the sore, but when this fails, we frequently derive advantage from washing the mouth with gargles composed of decoctions of

bark,—a solution of alum,—lime-water,—infusions of red rose leaves,—of oak-bark,—and other astringents.

In some cases, however, the sores become worse, notwithstanding the use of these, mercury, and every other remedy. They become ragged and unequal about the edges; they discharge a thin, fetid sanies; and in this state are commonly attended with much pain.

As long as the sore remains small, and does not shew any tendency to spread, there is in general cause to hope that a cure may be obtained; but whenever it has assumed the appearances I have enumerated, and when it does not yield to any of the means I have mentioned, as there will be little or no cause to doubt of its being cancerous, we should advise it without further delay to be cut out.

A cancerous sore, whether seated on the tongue, or on the inside of the cheek, if it does not run deep, may be extirpated with ease and safety; but when the substance either of the cheek or of the
tongue

tongue is much affected, it becomes an object of more importance, as being attended both with difficulty and hazard. Whatever the risk may be, however, if the diseased parts can be all removed, the operation should certainly be advised: For as we know of no other remedy upon which any dependence can be placed for the cure of cancer, it is surely better to submit to some risk than be left to certain misery and death.

When a deep-seated cancer in the cheek is to be removed, the easiest and most effectual method of doing it is to make an incision through the whole substance of the cheek, commencing at the contiguous angle of the mouth, and ending at the same point, after surrounding the sore: The diseased parts being removed, the sides of the cut should be laid neatly together; and a number of gold pins being introduced at proper distances along the course of it, a cure will be completed by the twisted suture, in the manner described in Section I. of this Chapter. In this

way very extensive cancerous sores may be removed without leaving much deformity ; while a very disagreeable unseemly cicatrix is always left after the usual method of doing this operation, by removing the diseased parts only, and allowing them to heal without drawing them together with futures.

In removing any considerable part of the tongue with the scalpel, as the hemorrhagy that ensues is the only symptom of hazard, the operator should be previously provided with all the ordinary means of putting a stop to it. When ligatures can be passed round the divided arteries, no other remedy should be trusted ; and this, I may remark, may be done more frequently, and at a greater depth in the mouth, than is commonly imagined. As the tongue can be pushed a considerable way out of the mouth, ligatures may be applied to wounded arteries, even when much of it has been taken away, merely with the common tenaculum or crooked needles ; but when this does not
answer,

answer, it may sometimes be done in the manner I have described in Section V. Ch. X. for the removal of scirrhus tonsils. A ligature being passed round the artery with the needle used in fig. 3. Plate XXXVIII. it may then be tightly twisted by passing the two ends of it through the double canula, fig. 1. Plate XXXI. or a knot may be formed upon it with the instrument, fig. 2. Plate XXXVIII.

When, however, the artery cannot be surrounded with a ligature, we must endeavour in some other manner to put a stop to the hemorrhagy. If the vessel is not large, keeping the mouth filled with astringent gargles, either of alcohol, a strong solution of alum, distilled vinegar, or water strongly impregnated with the vitriolic acid, will often answer: But when these do not succeed, the potential, or even the actual cautery, must be employed as the last resource.

The removal of any considerable part of the tongue, I must allow to be a very formidable operation: As such it has been

always considered; and accordingly it has been rarely practised. But, for the reasons that I have mentioned, I have no hesitation to say, that it is sometimes necessary, and in general that it may be done with safety. It ought not, however, to be attempted by every operator; for as it is always attended with a sudden discharge of blood, the application of means proper for the stoppage of this, obviating the effects of fainting, and other unexpected difficulties, that sometimes occur, require that steady, deliberate coolness, which a natural firmness of nerves, conjoined with much experience, alone can give.

SECTION XIII.

Of the Division of the FRÆNUM LINGUÆ.

WE sometimes find in children at birth, that the tongue is too closely tied down to the bottom of the mouth, owing to the frænum being either too short, or continued too near to the point of it. The method of cure is obvious: This membrane or ligament must be divided so as to allow the tongue to have free motion; and it should be done as soon as it is observed to be necessary, otherwise the suckling of the child may in the first place be impeded, and afterwards an interruption to speech may arise from it.

It is proper, however, to observe, that it is not a frequent occurrence; for although nurses often speak of children being tongue-tacked, that either do not suck readily, or that are backward in speaking,

speaking, yet all practitioners will allow that they seldom meet with it.

The division of this membrane is an easy operation; but it must be done with attention, otherwise the contiguous blood-vessels might be injured, by which such a quantity of blood might be lost as an infant could not easily bear: It is commonly done either with a scalpel or common scissors; but it may be performed both with more ease and safety with the instrument, fig. 3. Plate XLIX. The child being laid across the nurse's knees, the surgeon should open the mouth, and elevate the tongue with the index and middle finger of his left hand, while with the other he must introduce the instrument, so as to receive the middle of the frænum into the slit, which he may now divide with safety to any necessary depth.

SECTION XIV.

Of the Divisions of the PAROTID DUCT.

THE parotid gland of each side transmits the liquor which it secretes by a duct of the size of a crow's quill, which, after passing over part of the masseter muscle, penetrates the buccinator in an oblique direction, and empties itself into the mouth about the middle of the cheek.

In the operation described in Sect. XII. of this Chapter, that of extirpating cancerous fores from the cheek, as well as by various accidents, this duct is apt to be cut; and if the two divided ends of it be not retained together till they heal, the whole quantity of liquor which it ought to convey to the mouth is poured over the cheek; and the discharge being constantly kept up, the sore is thus prevented

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ed from healing, and a fistulous opening produced, corresponding to the size of the duct. As the fore commonly heals internally, the discharge would necessarily continue during life, if means were not used for preventing it.

In recent divisions of this duct, the best practice is to lay the two ends of it exactly together, and to retain them in this situation till they unite; by adhesive plasters, when this proves sufficient; or by the twisted future, when the retraction of the divided muscle is considerable: But when this has either been neglected at first, or fails of success, as the distant extremity of the duct soon heals, and is entirely obliterated at the divided end of it, owing to none of the fluid secreted by the gland passing through it, the only way in which a cure can be obtained is to make an artificial opening into the mouth, and to endeavour to form an union between it and the upper part of the duct leading from the gland.

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In making this passage, it ought to be carried as nearly as possible in the direction of the natural duct ; but in order to ensure success, it should be rather of a larger diameter than the duct. For this purpose, a sharp-pointed perforator of a proper size should be entered on the other side of the fore, exactly opposite and contiguous to the under extremity of the superior part of the duct ; and being carried with some degree of obliquity, it must in this manner be made to penetrate the mouth. This being done, a piece of leaden probe, nearly the size of the perforator, should be introduced along the course of the newly-formed opening, and retained in it till the sides of it become callous ; when, the lead being withdrawn, the end of the duct should be drawn into contact with the superior part of the artificial opening by means of a piece of adhesive plaster, and kept in this situation till a firm union has taken place. After taking out the lead, we have it in our power to forward the
cure,

cure, by rendering the end of the duct and of the newly-formed opening raw with the edge of a lancet or scalpel, before bringing them together. Till a firm adhesion takes place between them, the patient should be directed to live upon spoon-meat ; to speak little or none ; and to make as little exertion with his jaws as possible.

In this manner, fores, which would otherwise continue to discharge saliva for life, may be easily healed, with scarcely any mark of their having ever existed ; of which I have now had several instances, in all of which complete cures were obtained.

A common seton or cord of cotton has been recommended for this operation instead of lead ; and a bit of catgut has been used instead of it : But nothing renders the parts so quickly callous as lead ; and besides, it is more cleanly than a cord or tent of any softer substance.

CHAP-

CHAPTER XV.

*Of the Diseases of the EARS, and Operations
practised upon them.*

SECTION I.

Of Deafness.

DEAFNESS may proceed from various causes; for, as a free passage of sound to the Tympanum or Drum of the Ear, together with a sound state of this membrane and of the parts connected with it, are requisite for the sense of hearing, so whatever tends to obstruct the one, or to induce diseases of the other, will necessarily excite deafness.

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Two passages are appropriated for the purpose of conveying sound to the ear; one of them termed the Meatus Externus, terminating in the external ear; and the other the Tuba Eustachiana, ending in the throat. It is true, that the first of these is of more importance than the other, for it is larger, and more conveniently placed for collecting sound; but it is certain, that the latter or internal passage is a very necessary part of the organ of hearing; for when by any means it is stopped, deafness, to a greater or less degree, almost constantly ensues. Thus we observe, that any preternatural fullness or enlargement of the amygdalæ, especially when they are attacked with inflammation, is always attended with some degree of deafness. In this way, too, we account for that deafness to which patients are liable who have suffered much from venereal ulcers in the throat: and polypous excrescences that extend back from the nose and fauces, by compressing the

the Eustachian tube, are frequently productive of similar consequences.

In that variety of deafness which originates from this cause, a removal of the polypus, or swelled amygdalæ, will frequently accomplish a cure, while no other remedy can be of any avail. But when it is induced either by an ulcerated state of these parts, or by much inflammation, as the extremity of the duct will probably be obliterated, it would be in vain to employ any means of cure. It has indeed been proposed in this variety of obstruction, to endeavour to open the duct, by inserting the end of a curved blunt probe into it, or even to inject milk and water, or any other mild fluid, into it, with a curved syringe. But although a person well acquainted with the anatomy of the parts, may, by much practice, arrive at such perfection as to be able to do this with little difficulty upon a dead body, there is no reason to imagine that in practice any advantage will ever be derived from it: For even in a healthy

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state of these parts, the irritation which the end of a probe or of a syringe serves to excite on being made to touch them, must be so considerable as to render every attempt for inserting them very uncertain; and the difficulty must necessarily be increased where the extremity of the duct is obstructed by disease. But if we have not much in our power in the treatment of deafness arising from this cause, we are in many instances able to afford much relief, and even to restore the most perfect hearing where it has been entirely wanting, when the disease arises from obstruction in the external passage of the ear.

The meatus externus may be obstructed in various ways. It may be in an imperforated state at birth;—it may be more or less filled with extraneous bodies forced into it;—tumors or excrescences may form in it;—and it may be too much stuffed with wax, the natural secretion of the part. As each of these causes requires a method of treatment peculiar to itself, I shall consider them under separate heads.

§ I,

§ 1. *Of an Imperforated Meatus Auditorius.*

AMONG other natural deficiencies to which the human body is liable, none occurs more frequently than an imperforated state of some of the passages. This does not so frequently happen in the meatus auditorius as in others, owing perhaps to the lining membrane of this passage being every where attached to bone, by which it is prevented from collapsing. Notwithstanding, however, of this, different instances have occurred of it, and some variety is discovered in the nature of it.

In some cases the obstruction is formed by a thin membrane spread over the extremity of the passage; while in others a considerable part of the conduit is entirely filled with a firm fleshy kind of substance.

In the treatment of this variety of deafness, nothing can prove useful but the removal of the cause by an operation.

When this is to be done, the patient's head should be secured in a proper light, and at a convenient height, by an assistant ; when the operator, with a small sharp-pointed bistoury, should make an incision of a proper length exactly on the spot where the external passage of the ear should terminate. When covered by a membrane only, the operation will soon be finished ; but when impervious to any great depth, the incision must be continued, by passing the bistoury in a gradual manner farther in, either till the resistance is removed, or till there is reason to fear that the tympanum would be hurt, if it were carried deeper ; in which case the instrument should be withdrawn ; and in order to prevent the parts from adhering together, a bit of bougie properly oiled should be introduced, and retained till the cure is finished ; care being taken to remove it daily for the purpose of cleaning it, and for wiping off any matter that may have collected in the ear.

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In this manner deafness depending upon this cause may often be removed when the obstruction lies between the tympanum and the farther extremity of the meatus externus; and it should be always attempted about the time when the child should be beginning to speak. At a more early period, the child would not be so able to bear it; and when delayed much later, it would impede his speech; for we know that dumbness depends more frequently on a want of hearing than on any other cause.

§ 2. *Of Extraneous Bodies impacted in the Ear.*

ALTHOUGH the viscid nature of the wax of the ears is well calculated for preventing dust and other foreign matters from passing into them, yet we know that much distress is in some instances induced by this cause. Children often push small peas, cherry-stones, lead-drops, and other such articles into their ears, and flies

and other insects frequently creep into them.

When these lie near to the end of the passages, flies and other things that can be laid hold of should be extracted with small forceps, such as are delineated in Plate XLVIII. fig. 2. But peas and other round bodies are more easily removed, by turning them out with the end of a curved probe, or passing the end of the instrument, Plate XXV. fig. 1. behind them; and their extraction is facilitated by a little oil being previously dropped into the passage.

When insects have got so far into the ear that they cannot be taken out with forceps, the best method of removing them is to wash them out, by throwing in quantities of warm water, or any other mild liquid, with a syringe; but as they adhere while living with considerable firmness to the neighbouring parts, we should first endeavour to kill them, by filling the ear with oil, or any other liquid that proves poisonous to them without injuring the tympanum. Lime-water, spirit of wine,
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and other liquids, might be employed for this purpose: But nothing proves so harmless as oil; and although it does not kill every species of insect instantaneously, yet few of them live if immersed in it for any length of time. The patient should therefore be desired to rest his head on the opposite side; and some tepid oil being poured into the ear, it may thus be easily kept in it as long as is necessary.

Peas and other soft bodies that swell with moisture, are apt to become so large when they remain long in the ear, that they cannot but with much difficulty be extracted entire. In this case we should endeavour to break them, either with the points of small forceps, or with a sharp small hook cautiously introduced along the passage; and as soon as they are sufficiently divided, they must either be taken out piece-meal with forceps, or washed out with a syringe.

§ 3. *Of Excrescences in the Meatus Auditorius.*

I HAVE already treated of polypi in the nose and throat; and I may now remark, that the external passage of the ear is equally exposed to them. It is not indeed common for this kind of excrescence in the ear to arrive at such a bulk as they do in the nose; but whoever has paid attention to this branch of practice, will acknowledge, that they are by no means unfrequent, and they often appear to be the cause of very obstinate deafness.

On looking into the meatus auditorius, we sometimes find it filled with a polypous excrescence hanging loose by one pedicle; while at other times the passage appears to be obstructed merely by a thickness or fulness of the lining membrane of the ear, when no particular part of it is more diseased than another.

As polypi of this part are usually of a firmer texture than polypi in the nose,
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and as the membrane of the ear is firm, and does not readily yield, they cannot easily be extracted with forceps; but they may be taken out either with the knife, or with a ligature. When they lie near to the entrance of the external passage of the ear, and can be laid hold of either with small forceps, or with the dissecting hook, Plate XXXVIII. fig. 3. they may be cut out with the probe-pointed bistoury, represented in Plate XXXIX. fig. 3.; and as they do not appear to be so vascular, as similar excrescences in the nose, they may in this manner be removed with safety; for they seldom discharge much blood. But when they lie deep, it is better to remove them with ligatures; for as the passage is strait, a knife is in this situation introduced with difficulty, and used with uncertainty.

Various methods have been proposed for applying ligatures to excrescences in this situation; but the method of removing polypi of the nose, described in the explanation of Plate XXXIII. appears to be

be the best. With the forked probe, fig. 2. the doubling of a ligature may be pushed up at one side of the polypus till it reaches the root of it; and the two ends of the thread being carried round the excrescence, and inserted into a short double canula, such as is delineated in Plate XXXI. fig. 1. the canula should then be pushed to the root of the polypus on the opposite side; when the two ends of the ligature being drawn sufficiently tight, and fixed upon the knobs at the end of the tube, the probe may be withdrawn, and the polypus will drop off in a day or two.

But it often happens, that these excrescences cannot be removed in this manner; for instead of being pendulous by a small neck, they frequently extend to a considerable depth along the lining membrane of the ear. In this case escharotics have been recommended: But as they cannot be employed but with much risk of hurting the tympanum, they should never be used; and this especially, as the
disease

disease may in general be removed by means of a more simple nature. This affection of the membrane of the ear I consider to be exactly similar to that variety of obstruction in the urethra in which bougies prove particularly useful; and the same remedy, when duly persisted in, proves equally serviceable in the one disease as in the other. In the introduction of the bougie, care must be taken not to pass it to the depth of the tympanum, otherwise it may do more harm than good; and the size of it must from time to time be enlarged till the passage becomes sufficiently open.

When bougies are first passed into the ear, they always create some degree of uneasiness, by irritating the parts to which they are applied; but this soon subsides when they are used with caution, and properly oiled before being introduced.

§ 4. *Of Deafness from Wax collected in the Ears.*

WHETHER it is from the lining membrane of the ear being possessed of some degree of a contractile power, or from the outward extremity of the passage being somewhat lower than the other, that the cerumen or wax does not usually lodge in it, is perhaps difficult to determine; but it is certain, that in a healthy state of these parts they are usually very thinly covered with this secretion: Deafness in a certain degree is very commonly induced by the passage of the ear being stuffed with wax; for in this state it very effectually obstructs the passage of sound to the tympanum. It commonly happens too when wax remains long collected in the ear, that it becomes thick, and even hard, insomuch that in some instances it becomes almost as firm as a bit of timber.

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The treatment of deafness arising from this cause is obvious. By an attentive examination of the ear, we can distinguish with certainty whether there is a superabundance of wax or not : For by placing the ear in a clear sunshine, we can see even to the tympanum ; and whenever the passage is much obstructed with wax, we should not hesitate in advising it to be removed.

Different methods have been proposed for clearing the ears of wax ; but the safest and easiest is to wash or syringe them with warm water or any other mild liquid. Milk and water, or soap and water, answer the purpose : But before the operation a few drops of oil should be poured into the ear, not with a view to dissolve the wax, for more powerful solvents of this substance might be mentioned ; but for the purpose of lubricating the passage, by which the wax is more easily forced out. By a proper use of the syringe, which experience alone can teach, the ears may be entirely

entirely cleared of every obstruction produced by wax.

Although obstruction of the external passage of the ear is the most frequent cause of deafness; yet in some instances it is produced in a different manner. It may occur from a morbid state of the tympanum, and of the parts contained within it. To a certain degree it will take place, if either by accident or disease the external parts of the ear are destroyed; and it sometimes occurs from a deficiency of wax.

The small bones of the ears sometimes become diseased in scrofula, and the deafness that ensues from this is never in any instance removed. In such cases all that art can do, is to preserve the parts clean and free from smell, which is most effectually done by washing out evening and morning any matter that happens to collect in the passage, by throwing in warm milk and water with a syringe: For if this be not done, the matter discharged from the carious bones soon becomes offensive;

fenfive; and it continues to be fo, either till the diseased parts of the bones are entirely diffolved and difcharged, or perhaps during the life of the patient.

We ought not, however, to confound this difeafe with a difcharge that frequently takes place from the ears, of a milder nature. In fome cafes this appears to be the confequence of a boil or abfcess in the meatus externus; while in others it takes place without any previous impofthume, and feems to be induced by fome flight inflammation of the lining membrane of the ear, or perhaps of the tympanum itfelf.

This is a common occurrence, and for the moft part I think it is not properly treated. In general, it is fupposed to proceed from morbid humours in the fyftem; fo that fome risk is fupposed to attend any attempt that may be made for putting a ftop to it.

This, however, is wrong. In moft inftances the difcharge may be traced to the caufe I have mentioned, inflammation of
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the membrane of the ear ; which being of a local nature, no risk can ensue from checking it. And accordingly, in cases of this kind, I commonly advise injections, such as prove most useful in gonorrhœa. A weak solution of alum, or of saccharum saturni, frequently answers, or French brandy somewhat diluted. In some cases, pouring a few drops of any of these into the ears, morning and evening, proves sufficient ; but when this fails, they should be gently thrown in with a syringe.

It is proper here to remark, that the more early in the disease this practice is employed, the more effectual it usually proves ; so that it should never be long delayed. And besides, when the discharge has been of long duration, it not only does harm by relaxing or even destroying the tympanum, but some risk may thereafter arise from a sudden stop being put to an evacuation to which the system has for some time been accustomed. The danger, however, may be obviated by the previous introduction of an issue somewhat adequate

adequate to the discharge from the ear, either in the head, neck, or any other part; but in recent cases there is no necessity for putting the patient to the inconvenience of an issue; for here the discharge may with safety be stopped immediately.

When deafness takes place, either from relaxation of the tympanum, or from any deficiency in the external parts of the ear, some assistance may be derived from our endeavouring to collect or concentrate sound so as to make a stronger impression on the organ of hearing. Various instruments have been invented for this; but none of them answers so well as one nearly of the form of a common horn, such as is represented in Plate LII. fig. 2. Figure 1. is a convoluted tube employed for the same purpose; and fig. 3. represents an instrument intended to be concealed beneath the hair or wig, and to be fixed to the head by the two strings connected with it.

When, again, a deficiency of wax is suspected to be the cause of deafness, dropping a little oil of almonds, or any other mild oil into the ear, once or twice daily, proves sometimes useful. In some cases I have known benefit derived from a little soft soap being inserted into the passage; which not only keeps it moist, but by acting as a stimulus to the lining membrane of the ear, it tends thus to induce a return of the secretion of wax. With the same view too, I have sometimes employed strained galbanum made into a proper consistence with oil, along with a small proportion of the juice of an onion.

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SECTION II.

Of perforating the LOBES of the EARS.

BY medical writers of the 17th and preceding centuries, piercing the lobes of the ears is recommended as an operation that may prove useful in different diseases, particularly in affections of the head. In those times a small seton was drawn through the opening, with a view to induce a discharge of matter, which in some cases might prove useful. At present this operation is never employed but for the purpose of ornament.

This is perhaps the most simple of all operations; but as it is supposed to be of some importance by those on whom it is practised, it is necessary to describe it. As heavy ear-rings are apt to tear the parts, the opening should be made as high on the lobe as with propriety it can be

done; and the spot should be previously marked with ink. The patient being seated, and the head secured by an assistant, the lobe of the ear should be stretched upon a piece of cork placed beneath it. The surgeon is now to pierce it with the instrument, fig. 6. Plate LII. and having pushed it so far through that the tubular part of it is freely perceived on the opposite side, the cork must be withdrawn with the perforator stuck into it. A small piece of lead-wire is now to be inserted into the tube remaining in the ear; and on being drawn into the perforation, the lead must be left in it. By moving it daily, which may be done with little or no pain if it is previously rubbed with oil, the passage will soon become callous, and thus the operation is finished.

Before concluding the chapter on the diseases and operations on the ears, it may be expected that I should describe the method of cauterising or burning behind the ears for the toothach. At one period
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this operation was much employed, and different instruments were proposed for doing it. It is unnecessary, however, to delineate any of them; for the practice is now, I presume, very generally laid aside; and at any rate it may be done with a red hot probe of any kind equally well as with the neatest instrument. It was supposed to prove useful by burning or destroying the nerve producing the pain; but it would rather appear to act by inducing terror or surprise; and if this is the case, it is probable that the same operation would answer if practised in any other part. But as the pain attending it would by most people be considered as more severe even than the pulling of a tooth, it is not probable that it will ever be revived.

CHAPTER XVI.

Of the WRY NECK.

THE neck is sometimes considerably bent to one side: When this takes place to such a degree as to produce much deformity, the assistance of surgery becomes necessary.

The Wry Neck may be produced in various ways. It may depend upon an original mal-conformation of the bones of the neck:—On a preternatural degree of contraction in the muscles of one side of the neck, particularly of the sterno-mastoideus muscle:—Or, it may be induced merely by a contraction of the skin, in consequence of extensive sores and burns.

When the vertebræ of the neck are distorted, it would be in vain to attempt
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any means of relief; but either of the other causes I have mentioned seems to admit of almost a certain removal.

In books of surgery the operation for the wry neck is very commonly described; and as this deformity has in general been imagined to proceed solely from a contracted state of the sterno-mastoid muscle, a division of this muscle is usually proposed as the only means to be trusted. Even Mr Sharpe was of this opinion; and he delineates an instrument termed a Probe-razor for performing the operation*.

But were we even to admit that the division of this muscle was a necessary measure, the method of doing it by introducing the probe-razor beneath it and dividing it afterwards, appears to be exceptionable, as being attended with much risk of wounding the contiguous bloodvessels: It would surely be better to divide the muscle by repeated strokes of a scalpel, and to continue the incision in a gradual manner

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* Vide Sharpe's Surgery, Chap. xxxv.

manner to such a depth as may be necessary; by which even the large veins of the neck might be avoided. But although we allow that a wry neck may be sometimes produced by a contraction of this muscle, yet it appears to be a rare occurrence: I have now met with many instances of this deformity, and in all of them the contraction seemed to be in the skin alone.

When the skin only is affected, the parts are more easily divided and with less risk than when the deep-seated muscles are to be cut; but even this should be slowly done, so as to avoid the external jugular veins; for although no great harm might ensue from their being cut, they should never be wounded unnecessarily. But whether the cause of contraction is seated in the sterno-mastoid muscles, or in the skin, the incision should be carried so deep as to remove it entirely, otherwise little or no benefit will ensue from the operation.

We ought not, however, to conclude, that our object is accomplished on the contracted

contracted parts being divided ; for unless some method is employed to support the head during the cure of the fore, it will still be apt to incline more to this side than to the other, by which the parts newly divided will readily unite, so that no advantage will be derived from the incision. By Mr Sharpe and others, we are indeed advised to stuff the fore with lint, so as to prevent this inconvenience with as much certainty as possible ; but I know from experience that this does not succeed, and that nothing will answer but a firm support being given to the head. For this purpose the instrument represented in Plate LIV. fig. 1. answers well : It was made for a case of this kind, in which it was used for several weeks, and with complete success. It should always be worn, not only till the fore is healed, but for some time thereafter ; and if properly fitted to the parts upon which it rests, it is used with no uneasiness.

The skin beneath the chin is sometimes so much contracted in consequence of burns
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and other causes, as to draw the head considerably down upon the breast: The same method of cure must be practised for it that I have just recommended for the wry neck. The contracted skin must be freely divided with a scalpel, and the head properly supported from behind till the sore is cicatrised.

CHAPTER XVII.

Of Bronchotomy.

WHEN respiration becomes much obstructed and endangers the life of the patient, and when this appears to proceed from a local affection of the superior part of the wind-pipe, an operation commonly termed Bronchotomy is employed for relief. But as this consists in an opening made into the trachea, and not into the bronchiæ, it ought more properly to be named Tracheotomy.

This operation has in general been supposed to be of a more dangerous nature than it really is ; and this has prevented practitioners from advising it so frequently as they otherwise would have done.—By many, it is said to be seldom necessary ;

ry; and even some authors of eminence have asserted, "that it is useful only in that species of angina, where the throat is exceedingly enlarged by the swelling of the thyroid gland and parts adjacent." These are the words of Mr Sharpe in his treatise on this subject*.—But it is evident, that in this instance Mr Sharpe has written without full consideration; for, although a swelling of the thyroid gland may become so large as entirely to compress the trachea, and may thus render bronchotomy necessary, yet this is surely a rare occurrence; few practitioners have probably met with it; and there are not many, I presume, who have not performed the operation on other accounts.—The danger that once was supposed to attend it is not now dreaded, and accordingly it is more frequently advised; but still there is reason to think, that it should be oftener practised than it has hitherto been.

The causes that may render bronchotomy necessary are:

1. Spasmodic

* Operations in Surgery, Chap. xxxi.

1. Spasmodic affections of the muscles of the larynx, when they became so severe as to threaten suffocation: In some cases of catarrh, the mucus of these parts becomes so acrid, as to irritate the glottis in a most disagreeable manner. Even from this kind of irritation, it is evident from the sense of suffocation, which sometimes occurs, that much contraction is produced in the glottis: But this takes place in a more alarming degree, from hard substances of any kind passing below the epiglottis into the larynx; insomuch, that from this cause alone, suffocation has, in various instances, happened. Among others that might be recited, a remarkable history is recorded by Bonetus, of a child having died from a piece of bone passing into the trachea arteria; and it has often happened, that children, and even older people, have been suffocated by nut-shells, crusts of bread, and other substances passing into the trachea.

It has been alleged, that no alarming degree of contraction in the glottis can
ever

ever take place; and it has even been said, that the muscles with which it is furnished are not adequate to this effect. This opinion, however, originates from the very relaxed state in which these muscles are found after death; which is not by any means a fair method of judging; for we know well, that all the muscles in the body are after death found in a state of relaxation, however severely they may previously have been contracted.

2. A piece of bone, flesh, or any other firm substance, being lodged in the pharynx, or in the upper part of the œsophagus, and too large to pass down to the stomach, may by its bulk compress the posterior and membranous part of the trachea in such a manner as to produce a total obstruction to the passage of air into the lungs. Different instances have occurred in this place of suffocation being induced by a piece of flesh lodging in the superior part of the pharynx; for in such instances, it commonly happens that patients are irrecoverably dead before any assistance

assistance can be procured. I have myself met with several instances of this, in all of which the utmost certainty was obtained of respiration having been obstructed for a few minutes only ; and yet none of the people recovered, although all the means usually employed in such cases were immediately put in practice. But in all there was reason to think that bronchotomy would have proved effectual, had it been possible to procure more speedy assistance.

The event of these cases, as well as of some others of drowned persons, in whom respiration had been obstructed for a very short period only, and in whom every method now known was put in practice for their recovery, makes me conclude, that few, if any, have ever recovered in whom respiration has been totally obstructed for more than a few minutes.

After all the attention that I have been able to give to cases of this kind, I would say, that complete interruption to breathing, for the space of five minutes only, must,

must, in perhaps every instance, prove fatal. We have heard indeed of the recovery of many drowned people after they had been half an hour, nay even hours, under water; but these accounts of the time which bodies have remained immersed are seldom accurately obtained, from the general inclination in bystanders to exaggerate, as well as from other causes; so that little or no credit is in general due to them.

3. Polypous excrescences in the nose have been known to fall so far into the pharynx as to endanger suffocation; and it very commonly happens, that these tumors, which originate either from the uvula or from the superior part of the pharynx, are attended with this effect; in all of these, when extirpation with a ligature is to be attempted, if the tumor is large, it is with much difficulty that the necessary apparatus is applied. This, however, may be much facilitated by a previous opening of the trachea, which admits

mits of easy respiration while the ligature is forming round the base of the tumor.

4. Tumors that are firm, particularly those of the scirrhous and fleshy kinds, even when seated externally, have been known to compress the trachea so much as almost entirely to obstruct respiration: When so situated as to cover all the accessible part of the trachea, which, in the latter stages of the tumor termed Bronchocele, is too frequently the case, this operation is inadmissible; but much benefit may be derived from it whenever it can with safety be performed.

5. An instance is mentioned by Dr Richter, of an inflammation of the tongue arriving at such a height as entirely to obstruct the passage to the fauces; and different instances have occurred of mercurial salivations, when carried too far, inducing such a tumefied state of the glands in the mouth and throat, as to be attended with the same effect. In one case that I met with several years ago, and in which the glands of the throat were naturally

large, such complete obstruction was produced to the passage of the air, as required the aid of this operation to save the patient. In this instance, such a quantity of mercury had been quickly thrown in, that the swelling of these glands arrived at an alarming height in the space of a few hours from its commencement; and although all the remedies usually employed in such cases were put in practice, none of them had any effect: The operation was, contrary to my opinion, delayed till the patient was almost completely suffocated; but he revived instantly on the perforation being made.

6. Swellings of the amygdalæ and contiguous parts, which do not terminate speedily in suppuration, when they become large are apt to induce an obstructed respiration; and may thus render bronchotomy necessary. It is not such tumors, however, as originate entirely from inflammation that most frequently come to this length: Hard swellings of the amygdalæ, when attacked with inflammation, are

are sometimes known to produce such tumors in the fauces as entirely shut p the passage, which none of the usual remedies will remove; and which, therefore, require the aid of this operation. But in real inflammatory tumors of these parts, constituting the angina inflammatoria of authors, unless the glands have been morbidly enlarged before the commencement of inflammation, the swelling will seldom or perhaps never, proceed to such a height as to require it. When swellings of this kind arrive at a large size, we almost constantly find, that they do so from their having gone into a state of suppuration, when relief may be obtained by means of a more simple nature than bronchotomy, namely, by discharging the matter contained in the tumor by an incision or a puncture. A common scalpel or bistoury, wrapped up with a piece of linen near to the point, is generally used for puncturing the amygdalæ and other parts of the fauces; but no precau-

tion whatever will render this a safe instrument for these purposes. In Plates XL. and LVII. are represented different forms of canulas containing concealed lancets, which every surgeon ought to have, as by means of them any part of the throat may be scarified with safety.

7. Among the means employed for restoring the circulation in people who have been long under water, or where respiration has been obstructed in any other manner, blowing air into the lungs, and repeatedly discharging it, is, perhaps, more to be trusted than any other; for, the action which is thus given to the lungs is readily communicated to the heart itself. The usual method of throwing air into the lungs in such cases, is by blowing forcibly into the mouth while the nostrils are compressed; or by means of a curved tube inserted at one of the nostrils, so as to make its extremity terminate immediately above the glottis.

But, although one or other of these methods may, in some instances, answer the purpose

purpose of filling the lungs with air, yet I know from experience, that it will not commonly succeed. In different instances of people who had been a few minutes under water, several attempts of this kind were made for throwing air into the chest; but, either from some contraction of the epiglottis, or of the superior part of the larynx, none of them were found to succeed; and, as bronchotomy was in both cases obliged to be performed for effecting it, I am therefore warranted in mentioning this as one cause that may render it necessary.

When, from any of these causes, respiration becomes so much obstructed as to endanger the patient's existence, bronchotomy should be immediately advised; and the method of performing it is this.

Whenever it is necessary to have a patient firmly secured during an operation, he should always be placed upon a table; and as this is a matter of much importance in bronchotomy, a table should be preferred to a chair. The patient

being laid upon a table, with his head drawn back and limbs secured by assistants, a longitudinal incision should be made with a scalpel, through the skin and cellular substance on the middle and inferior part of the trachea, beginning at the inferior part of the thyroid cartilage, and proceeding downwards for the space of an inch. The sterno-thyroidei muscles are thus brought into view; and being separated from one another, a considerable portion of the thyroid gland is in this manner laid bare. As this gland is plentifully supplied with bloodvessels, and as the division of any of these proves always troublesome, and in some instances even dangerous, it should with much attention be guarded against. This may commonly be easily done, by avoiding the inferior portion of the gland, where the two lobes of which it is composed unite, and finishing the operation at the upper part of it where they separate. In order, too, to guard as much as possible against the inconvenience arising from the

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the division of the arteries of this gland, the incision should be slowly made; and, as the arteries are of such magnitude as to be perceptible to the naked eye, they may, with due care, be avoided.

The cellular substance lying between these portions of the gland being cautiously removed, the trachea is thus laid bare; and if no large bloodvessel has been divided, the operation may be immediately finished, by making an opening between any two of the cartilages; but if any large artery has been cut, it must be secured with a ligature before going further. Authors differ much in their opinion of the best manner of finishing this part of the operation. By some we are desired to make an opening with a scalpel, while others prefer the point of a lancet; and by all, the perforation is advised to be of such a size as to receive a tube or canula of silver, through which a quantity of air may be transmitted fully sufficient for the purpose of respiration; but, as much mischief ensues from blood

getting into the trachea, by the convulsive cough which it induces; and as this can scarcely be prevented in the usual manner of performing the operation, it has been proposed to employ a cutting instrument adapted to a canula of a proper size for being left in the opening. Descriptions of instruments for this purpose may be met with in the works of the ingenious Dr Richter of Gottingen *, to which I have already referred, and also in the fourth volume of the Memoirs of the Royal Academy of Surgery of Paris, by Mr Bauchot.

An instrument which I consider as an improvement upon these, with which I have twice performed this operation, is delineated in Plate XXIII. fig. 3. It is nearly of the form of a flat trocar, but not quite so long. The patient's head being still supported and somewhat drawn back, the point of the stilette must be made to penetrate

* Vide Augusti Gottlieb Richteri D. Medicinæ Professoris Gottingensis, *Observ. chirurg. Fascicul. secund. cap. iii.*—Gottingæ 1776.

penetrate the membrane between two of the cartilages ; and the extremity of the canula being pushed fairly into the trachea, the filette is to be withdrawn, and the canula afterwards secured, by a piece of tape connected with it being tied on the back of the neck.

The instrument is here represented without encumbrances from the dressings ; but before being introduced, it should be passed through the centre of three or four thin compresses of linen : These not only serve to cover the pledget of emollient ointment with which the wound should be protected after the filette is withdrawn, but by withdrawing one or more of them, which may be easily done without moving the instrument, merely by cutting up their sides with a pair of scissars, the length of the canula may thus be augmented at pleasure ; and which, in the event of the parts about the wound becoming swelled, is found to be a very important precaution ; for, when neglected, a very slight tumefaction on the sides of
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the fore will throw the canula out. The canula should, therefore, be always of such a length as may obviate the inconvenience that might ensue from this accession of swelling. For this purpose, it should never be less than two inches long: When first introduced, just as much of its extremity should be left uncovered by the compresses as admits of its passing easily into the trachea. If any swelling takes place, one, two, or more plies of the linen being cut off, will still admit of the canula penetrating to the same depth; and, on the contrary, when it happens that the parts are swelled at the time of the operation, as the quantity of tube lodged in the trachea might be too much increased on the swelling being removed, the inconvenience that would otherwise ensue may be easily prevented, by some additional plies of linen being inserted between any two of the compresses.

On experience we find, that a double canula answers best in this operation. When one tube only is used, it is apt to fill
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with mucus ; and as it must frequently be taken out for the removal of this, respiration is in the mean time apt to be impeded : But when a double tube is employed, the inner canula can be easily removed, cleaned, and replaced, while every inconvenience that would otherwise result from it is prevented by the other being left in the opening. When, therefore, the outer canula of the tube is properly fixed, the other having been previously adapted to it, and the opening in the canula covered with a piece of crape or fine muslin, to prevent the admission of dust, the operation is in this manner completed.

As the intention of this operation is to obviate the inconveniencies arising from an obstructed respiration, it is evident that the canula should be continued in the wound as long as the cause that first gave rise to it exists. If a piece of bone or any other substance has passed into the trachea, and if this cannot be extracted at the opening newly made, a curved probe should be introduced at it, in order to ascertain

ascertain the situation of the extraneous body ; and this being done, another perforation must be made directly above it. In this manner, this cause of the disease may, in some instances, be removed, and when obstructions of a different kind are found to take place, the means best adapted for their removal should be immediately employed. But till the breathing becomes perfectly easy, the canula must be continued ; and when at last it is judged proper to withdraw it, the skin should be immediately drawn over the orifice, and retained there with a piece of adhesive plaster, by which means a cure of the fore will soon be obtained.

Dr Richter, among other improvements which he proposes upon this operation, advises the canula to be curved ; but, in the different instances in which I have had occasion to perform it, none of the inconveniencies occurred which the Doctor supposes may proceed from employing a straight one : I have found indeed that the straight canula answers every purpose ;
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and as a curved tube cannot have another exactly fitted to it to be occasionally inserted and withdrawn, this I think is a sufficient reason for not adopting the curved canula of Dr Richter.

To such as have not had opportunities of performing this operation, the attention that I have advised, to a proper regulation of the length of the canula, may appear to be unnecessary. This, however, is far from being the case; and much embarrassment would ensue from the neglect of it. The means that I have recommended for this purpose are simple, are at all times easily procured, and, upon trial, I have found that they answer the purpose: But a very neat and ingenious contrivance for the same intention has long been exhibited by Dr Monroe in his course of surgery; and of which he has been so obliging as to admit of a delineation being here given. It is represented in Plate LVI. fig. 1.

CHAPTER XVIII.

Of Oesophagotomy.

SUBSTANCES are frequently taken into the pharynx, which, in passing into the œsophagus, are too bulky to be forced down to the stomach by the muscular exertion of the parts at which they stop. When any part of substances in this situation can be observed on looking into the pharynx, they are in general easily removed with common forceps; but when they have passed entirely out of the pharynx, and are lodged deep in the œsophagus; this cannot be done, and in such circumstances we are obliged either to allow the substance to remain where it is fixed; to push it into the stomach; or to extract it by laying the œsophagus open.

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When the substance resting in the œsophagus is of a soft texture, such as bread, cheese, or even flesh, the easiest and best method of getting free of it is, to push it into the stomach with an instrument termed a Probang, Plate LVII. fig. 1. and 2. This is much safer and easier than to attempt to bring it up, as is frequently advised, by a strong emetic; for when this does not succeed, the exertion of vomiting in this obstructed state of the œsophagus is very apt to do harm.

But when a pin, a piece of sharp bone, or any other firm substance, is fixed in the passage, we should by no means attempt to push it down; for, by doing so, if it does not go into the stomach, any point or roughness with which it is furnished, might be pushed directly into the substance of the œsophagus, as in several instances I know has happened.

I think it necessary to observe, that this is a point of importance, and ought therefore to meet with attention. In every case of obstruction of the œsophagus,

gus, arising from a foreign body being fixed in it, it is almost the universal practice to endeavour to push it into the stomach. When the obstructing substance is of a soft yielding nature, such as bread, or a piece of flesh, this may commonly be done with safety ; but for the reason that I have given, it will very frequently do mischief when it is hard. In every case, therefore, where the pain is not great ; if the breathing is not much affected ; and the passage still so pervious as to permit the food to get down to the stomach, no attempt should be made for removing it ; for we know from experience, that, in most instances, every thing of this kind is at last carried down, either by the action of the œsophagus itself, by some degree of dissolution taking place in the substance lodged in it, or by some partial suppuration forming in the œsophagus, by which that part of the extraneous body that was fixed in it becomes loose.

But where the obstruction is so complete as to prevent the passage of nourishment

ment to the stomach, or when the breathing is much interrupted, if the cause of obstruction cannot be removed by other means, it comes to be a question whether any attempt should be made for taking it out by an incision. As the œsophagus lies deep, being covered with the trachea, and as different bloodvessels and nerves of magnitude and importance lie near it, it has always been very justly considered as dangerous to make an incision into it; and, in general, it has been laid down as an established maxim never to attempt it.

But although no practitioner would think it advisable to perform this operation without some reason of importance, yet in such instances as those to which I allude, where much danger must ensue from any material interruption being formed, either to the passage of food to the stomach, or of air into the lungs, it would surely be preferable to give the patient a chance, even from this doubtful remedy, than to allow him to meet a certain and miserable death.

Notwithstanding a very general prejudice that prevails against this operation, I think we are sufficiently warranted in recommending it in those causes of obstructions in the œsophagus that cannot be otherwise removed; and the opinion is founded on the following circumstances: Wounds in the œsophagus, whether inflicted by accident or design, have been frequently cured, different instances of which have fallen within my own knowledge, the most remarkable of which was the case of a man, who, in an attempt to destroy himself, cut the trachea on the right side completely through, and likewise penetrated the œsophagus; and among other instances recorded by authors of wounds in the œsophagus being cured, one is mentioned by Bohnius; in which, from the food passing freely out at the wound, it was evident, that the œsophagus was injured, and yet a cure was easily accomplished.

By various experiments, this operation is found to be safely practicable on dogs and

and other animals, in which the structure of the parts concerned is nearly the same as in the human body: It has been repeatedly done on the dead subject, without any injury to the contiguous large bloodvessels or nerves; and, lastly, there are at least two instances upon record, of its having been performed with safety and success on living subjects *. I have therefore no hesitation in saying, that cases may occur in which it may be proper to cut into the œsophagus.

Besides those obstructions arising from the causes that I have mentioned, instances sometimes occur of the œsophagus being so completely stopped by constrictions and tumors, that all communication between the mouth and the stomach is cut off.

When the stricture is seated in the superior part of the œsophagus, making an opening into it may, in some instances, be sometimes advisable, with a view to

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* Vide Mémoires de l'Académie Royale de Chirurgie, tom. iii. p. 14. Paris, 1756.

the conveyance of nourishment into the stomach: Any advantage, however, to be obtained in such cases from the operation, will in general prove only temporary, as diseases of this kind have hitherto resisted every attempt that has been made for removing them.

By many anatomists the œsophagus is represented as lying evidently to the left side: If it stretches, however, to the left, it is in a very inconsiderable degree; but this consideration may render it proper to prefer the left side for this operation; the method of performing which is this: The patient being secured in the manner I have desired for Bronchotomy, and his head drawn back and kept firm by an assistant, an incision should be made with a scalpel, at least two inches in length, directly through the skin and cellular substance, keeping close by the side of the trachea, and commencing about half an inch above the seat of the obstructing substance when this can be done; and where this is impracticable, by the obstruction
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being within the cavity of the chest, the incision should commence about an inch and a half above the breast-bone.

The cellular substance being freely divided, the sterno-thyroidæi and sterno-hyoidæi muscles, together with a portion of the thyroid gland, will be brought into view: With a flat blunt hook, one assistant should pull the muscles gently to the left side, while another by the same means is employed in pulling the trachea somewhat to the right, so as to admit of the œsophagus being brought into view. If any large bloodvessel is thus unavoidably divided, it should now be secured with a ligature; and this being done, the operator is to proceed to open the œsophagus. When the piece of bone or other substance fixed in the passage is discovered by the finger, the perforation should be made directly upon it, and the cut, which should always be longitudinal, being made of a sufficient size for extracting it, this should be immediately done with small forceps. But when the cause of obstruc-

tion is found to lie within the cavity of the chest, which must add greatly to the hazard of the operation, the œsophagus ought in this case to be opened immediately above its entrance into the chest; care being taken, in order to give sufficient room for what is to follow, that the opening in the œsophagus be extended upwards to the full height of the external incision. This being done, a large firm probe should be introduced, in order to determine the seat of the obstruction, when by means of long small forceps, the substance producing the mischief should be cautiously laid hold of, and slowly extracted.

The operation being in this manner finished, all our attention is to be given to the treatment of the sore, and nourishment of the patient. When the operation is performed for some disease in the superior part of the œsophagus, till this is either removed by medicines, or by an operation, which in cases of compression from tumors may sometimes be done, our principal

cipal object is the conveyance of nourishment to the stomach: In such instances, there is a necessity for preserving the opening in the œsophagus. But when the operation has been performed for the purpose of removing a foreign substance fixed in the passage, as soon as this is accomplished, nothing should be omitted that can tend to promote an immediate reunion of the divided parts. If, in such circumstances, the patient is allowed either to eat or drink much, the opening in the œsophagus will be found difficult to heal, and may become fistulous. It will therefore be more prudent to recommend total abstinence from solid food for several days, and to convey nourishment, in the form of strong soups, by the anus, and allowing very small quantities of milk or soup to be swallowed from time to time: By preventing the patient from moving his neck, and treating the wound in the same manner with similar affections in other parts, we know from experience, that a cure may at last be obtained; and, at any rate, if this should not

happen, and if the wound should remain fistulous, or even if death should succeed, still the operator will have the consolation of having attempted every probable means for the safety of his patient. In addition to what I have already observed of the propriety of this operation in particular cases, I may remark, that the hazard attending it is not so great as is commonly imagined. If the incision is made in the manner I have directed, close by the side of the trachea, no injury can be done to any of the larger arteries or veins: The only bloodvessels we have to be aware of, are those branches of the laryngeal artery that supply the thyroid gland. With proper caution, the principal arteries of the gland may in general be avoided; but if any of them should be divided, they may commonly be secured with ligatures, especially if the external incision is sufficiently free: In proceeding with caution too, that branch of the eighth pair of nerves, which from its inverted direction has been termed the Recurrent Nerve, and

and which runs close by the side of the œsophagus, may in general be avoided; and even in the event of some branches of this nerve being divided, the only bad consequences that probably would ensue, would be some degree of weakness in the voice; for the muscles of the larynx, in which they are chiefly spent, do not depend entirely upon them.

CHAPTER XIX.

Of DISEASES of the NIPPLES.

THE Nipples are in some cases so deeply sunk in the breast, that a child in attempting to suck, finds it difficult or even impossible to lay hold of them.

To remedy this inconvenience, different means are employed. If the prominent part of the breast can be pressed so far back as to uncover even a small part only of the nipple, it may commonly be drawn out by getting a stout child of six or eight months old to suck it: But as this cannot be always done, glasses of different kinds are employed for the purpose. In Plate LIII. figures 1. and 3. are represented two forms of glasses with which the breast
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may either be sucked by the patient herself or by an assistant ; and fig. 2. is a glass cup mounted with a bag of elastic gum. In using this, the air must be pressed entirely out of the bag, when the cup being placed upon the breast so as to include the nipple, such a degree of suction is produced as very commonly draws it out. The bag, however, should be much larger than usual, otherwise it does not act with sufficient force. But whichever of these means is employed, it should be continued till the nipple is drawn fully out ; and always repeated before the child attempts to suck.

The nipples, like every other part of the body, are liable to ulcerations ; but from their peculiar delicacy, any sores with which they are attacked, are always productive of much distress, while the sucking of the child tends not only to render them worse, but of much longer duration than they otherwise would be. Cracks or chops in the nipples have not a formidable appearance, but they are commonly

monly much more painful than ulcers of the greatest extent in other parts of the body.

Various remedies are employed for these affections, but emollients are most frequently used : I have not found, however, that they ever give permanent relief ; for although they may procure temporary ease, it seldom or never proves of long duration. Mild astringents and drying applications prove more useful. As a wash, lime-water, weak saturnine solutions, and solutions of allum, prove serviceable ; and Port-wine and water, or brandy sufficiently diluted, may be employed for the same purpose. After bathing the parts with one or other of these, the nipple should be covered with soft lint, spread with Unguentum Nutritum, or Goulard's cerate ; but of these the first is the best : I have often used it with advantage, and I know of nothing that answers so well in chaps or cracks wherever they are situated. It is proper, however, to observe, that the nipple should be entirely cleared of this application always

ways before the child is allowed to suck ; for as lead forms the most important part of it, mischief might ensue from much of it being carried into the stomach.

Till the nipple is completely healed, the child should not be allowed to suck oftener than is quite necessary ; and when one of the nipples only is sore, this may be easily managed, as the child may be kept at the sound breast, while the other is drawn from time to time with a glass which does not injure the nipple. In Plate LIV. fig. 2. 3. and 4. small cups are delineated for protecting the nipples during the cure. When properly fitted to the parts, they not only protect them from the friction of the clothes, but allow the milk to run off as quickly as it falls from the breast.

CHAPTER XX.

Of the Amputation of Cancerous Mammæ.

CANCER has been known to attack almost every part of the body ; but we meet with it more frequently in the breasts of women than in almost any other part.

In Chapter II. Section VIII. I entered fully into the consideration of cancer : I have now, therefore, to refer to that part of the work for the description and diagnosis as well as for the medical treatment of the disease ; and in this chapter, I shall chiefly adhere to the removal of cancerous tumors of the mammæ by amputation.

A real cancer is perhaps the most formidable disease to which the human body is liable : Wherever it is seated, its consequences

sequences are to be dreaded ; but more especially when fixed on one or both of the mammæ. Various causes have been assigned for cancer proving more malignant in this situation than in others ; but the obvious reason of it is, that cancers being very commonly seated in glands, and the breast being entirely glandular, cancer is necessarily more apt to form in it than in parts not so extensive.

In Chapter II. Section VIII. I endeavoured to shew, that cancer, on its first appearance, is perhaps, in every instance, a local disease ; that the cancerous diathesis is produced, not by any original disease in the constitution, but by absorption, from a local ulcer ; and hence I observed, that cancerous sores should be removed by immediate amputation, wherever this can be done.

This, I think, should be an established maxim in the treatment of cancer wherever it is situated ; but from its being more apt to infect the constitution, when seated on the mammæ than on other parts
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of the body, this is an additional reason for early amputation in cancer of the breast.

As every scirrhus gland in the mammæ is apt to degenerate into cancer, and as indurations of the mammæ have hitherto resisted the effects of every other remedy, early amputation should in every instance be advised: This, I know, is a point with respect to which practitioners are not agreed; some having alleged, that, as scirrhus glands in the mammæ have been known to remain in an indolent, inoffensive state for a great length of time, their removal should never be advised till they have actually gone into a state of ulceration.

But this opinion, which is evidently founded in timidity, has been the cause of much unnecessary distress to a great proportion of all by whom it has been followed; while it has served to bring the operation of amputating cancerous breasts into a degree of general discredit, which it does not merit. There is no fact of
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which I am more convinced, than that many more would recover by means of the operation, were it employed in a more early period of the disease, particularly while the glands are still in a schirrous state, and before any matter is formed in them: and as instances of their remaining long in an indolent state are exceedingly rare, no dependence should ever be placed on their doing so.—It is not a single instance or two, in matters of such importance, on which an opinion ought to be formed: It is the result of general observation that ought to direct us; and every unbiassed practitioner must confess, that what I have here asserted respecting this matter is, at least in general, well-founded.

The propriety of amputating schirrous breasts early being admitted, and the practice established, it may possibly happen in a few instances, that schirrous tumors of this part may be removed, which might have remained in an indolent state for some time longer. But as this would not

frequently be the case; as we have no means by which we can judge with certainty, between such cases as might remain for some time in this indolent state, and those which might proceed more rapidly; and especially, as the advantages derived from early amputation are unquestionably great; no hesitation should occur in putting it universally in practice.

When practitioners, therefore, have an opportunity of amputating cancerous or schirrous breasts early, they ought always to embrace it. It often happens, however, from an improper delicacy in patients, as well as from other causes, that practitioners are not consulted till the disease is far advanced. But, although the advantages to be derived from the operation will, in general, be in proportion to the previous duration of the disease; yet on all occasions, even in very advanced stages of cancer, it is right to advise it, provided the parts affected can be completely removed. When this cannot be accomplished, from
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the cancerous parts lying too deep, or being immediately connected with organs essentially necessary to life, by which amputation of the one cannot be performed without much injury being done to the other; in such circumstances, as the operation would not be of any real utility, it should not be advised; for, as all the diseased parts could not with propriety be removed, and as the cancerous virus is of a very assimilating nature, it would answer no beneficial purpose to amputate only a portion. But in every instance where the diseased parts can be safely separated from the sound, as nothing but their removal can afford any chance of safety, I must again say, that we should not hesitate to advise the operation. I shall now proceed to describe the method of performing it.

In every chirurgical operation it should be an established maxim to save as much sound skin as possible. Such portions of the common teguments as are diseased, or that adhere firmly to the parts below,

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ought certainly to be taken away ; but it can never be proper to remove more than this : For it is now universally known, that the cutis vera is never regenerated ; and when destroyed, that the parts underneath are afterwards covered with thin scarf-skin only. This, however, is not the only objection to an extensive removal of skin : In every operation where much of it is destroyed, the wound that remains is necessarily much more extensive, and the cure therefore more tedious, than when little, or perhaps no skin has been taken away. Indeed, this is so much the case, that in operations where no skin has been removed, cures will be sometimes accomplished in a few days, which, by the removal of much skin in the usual way of performing the same operation, would be protracted to many weeks or months.

This practice of removing much skin in the amputation of tumors, seems to have originated from an idea that has long and very universally prevailed, of the skin
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being by much distention apt to lose its tone so entirely as not to be able to recover it again; and therefore, that in every such instance, a considerable part of it should be taken away. This, however, is by no means the case; and whoever will adopt a different practice, will find, that tumors rarely or never become so extensive as to destroy the elasticity of the skin that surrounds them.—Inflammatory tumors, indeed, proceed frequently with such rapidity to a large size, as to distend the skin more quickly than it can properly bear, and at last burst it entirely when suppuration takes place: But in almost every other variety of tumor, the progress of the swelling is so slow and gradual, that the natural contractile power of the skin is seldom or never so far destroyed by it, as to prevent it from recovering its tone on the cause producing the distention being removed: And in cases of scirrhus breasts, this contractile power of the skin is commonly so remarkable, that, even when the breast is much enlarged, and all

the glandular part of it removed, the skin, if it has been preserved, almost constantly contracts to the size of the remaining fore; so that, in all such cases, none of the skin should be removed that is not either actually diseased, or adhering so firmly to the parts below, that it cannot be easily separated.

In proceeding to the operation, the patient must be either firmly seated in an arm-chair, her head being supported with a pillow by an assistant behind, whilst her arms are properly secured by an assistant on each side; or she may be placed upon a table, which answers better than any other position: In this manner she is more easily secured; faintings are less apt to occur; and the surgeon proceeds with more ease through every part of the operation, than when the patient is seated in a chair. But in whatever position she may be placed, the surgeon should for certain be seated: Surgeons, indeed, perform this operation most frequently while standing before the patient; but no operator will
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ever attempt it in this manner, who has once experienced the advantages that result from doing it in the manner I have advised.

In the first place, I shall suppose the operation to be performed for a schirrus of the mamma, while the skin is still sound, and without adhering to the parts beneath. In these circumstances, an incision should be made with a scalpel through the skin and cellular substance, from one extremity of the tumor to the other; taking care to direct the scalpel so that it may avoid the nipple, by carrying it an inch or so to one side of it. When the disease has extended, as it sometimes does, beyond the mamma towards the sternum, as this commonly throws the longest diameter of the tumor across the body, this external incision should run in a direction corresponding to the length of the tumor, by making it to commence at one side of the mamma, and terminate at the other; but when the mamma alone is diseased, the external incision should run in a perpen-

dicular direction, commencing at the upper part of the tumor, and finishing at the most depending point of it. By this means, any matter that may form during the cure is freely discharged; which does not happen when the incision runs in a transverse direction, unless the inferior portion of the teguments is afterwards divided from above downwards; which, in such cases, should always be done; For although, in some instances, a cure is easily obtained, even where this precaution is not kept in view, yet, in general, some inconvenience would ensue from the neglect of it.

The skin and cellular substance being thus freely divided, are now to be separated from the diseased parts below by a slow and steady dissection; and this being accomplished, the teguments should be kept asunder by assistants, till all the glandular part of the breast is dissected from the pectoral muscle and other parts with which they are connected. With a view to preserve the pectoral muscle as much as possible from being cut by the
scalpel,

scalpel, the arm of the affected side should be kept extended somewhat above a horizontal direction; by which means all the fibres of this muscle are preserved in a state of extension, and are thus less liable to be injured during the operation than when they are kept relaxed.

It often happens, indeed, that the diseased parts adhere to the pectoral muscle; and, in some instances, even to the periosteum of the ribs. In such cases, as all the diseased parts must be removed, we should not hesitate to use every necessary freedom with the pectoral muscle, as well as with every other part to which the mamma adheres; but whenever the removal of the disease can be accomplished without injuring these parts, it ought undoubtedly to be done.

On the mamma being removed, the operator should examine with much accuracy, not only the surface of the fore, but the parts beneath the edges of the divided skin; and if any indurated glands are discovered, they should all be removed.

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In this part of the operation, much care and attention is requisite; for unless all the diseased glands are removed, no advantage will be derived from it.

I have desired that the whole glandular part of the mamma should be removed. Even where a small portion of it only is diseased, the whole should in general be taken away; for no good purpose can be answered by a portion of it being left; and in many instances where this had been done, mischief ensues from the disease making its appearance again in some part of the glands which remain. When indeed it is found that a single loose gland only is diseased, it may be taken out without injuring the rest of the breast; but whenever the disease is extensive, the whole mamma should be removed.

The next step in the operation is to secure the divided arteries, and it should always be done with the tenaculum. As the arteries of the mamma are frequently small and numerous, much attention is necessary to discover them. All the coagulated

gulated blood should be effectually cleared away with a sponge and warm water ; and if the patient is faint, a glass of wine or some other cordial should be exhibited ; by which means small branches of arteries are often discovered which otherwise would escape notice, and which if neglected might induce much hazard and distress.

The bloodvessels being thus secured, and the surface of the sore cleared of blood, the divided teguments should be brought together ; and, in order to secure them with accuracy in their situation, ligatures should be introduced at those points where they are most likely to answer the purpose. I have sometimes employed flips of adhesive plaster instead of ligatures, but they do not retain the parts so exactly in their situation ; and the pain which ligatures excite is too trifling to be mentioned.

In securing the teguments in this manner, care must be taken to leave all the ligatures of the arteries hanging an inch
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or two out from the wound, so that they may be withdrawn in a few days; which in general may be easily and safely done when they have been applied with the tenaculum.

In order to promote the adhesion of the teguments to the parts beneath, moderate pressure should be applied over the whole by means of the napkin and scapulary bandage; but before applying it, the parts should be all covered with a piece of soft lint spread with any emollient ointment, and over this there should be a thick compress either of lint, tow, or soft old linen.

In this manner, when no portion of the teguments has been removed, as the whole fore will be covered with skin, a cure will be obtained by a process which surgeons in general have termed “the first intention;” that is, without the formation of matter.

But it does not often happen that the operation is advised whilst this mode of practising it is admissible. In general, before

fore a practitioner recommends amputation of a breast, and still more frequently before a patient consents to it, a considerable portion of the external teguments are so much diseased, as to render it necessary to remove them along with the glandular part of the mamma; or, if the skin is not actually diseased, it commonly adheres so much to the most prominent part of the breast, that it cannot be separated from it. In either of these circumstances, some portion of the skin must be removed along with the mamma; and the easiest method of doing it is this: A longitudinal incision should be made, in the manner I have advised, through such parts of the teguments as are perfectly sound, whilst that portion of the skin that is diseased, or which adheres firmly to the glandular part of the breast, should be separated from the sound skin, by a circular or oblong incision, with which the longitudinal cut ought to communicate; and this being done, the operation is to be finished by dissecting off every part that
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is indurated, along with that portion of the skin which in this manner has been furrounded with an incision such as I have mentioned.

In the after state of the fore, a material difference takes place between the operation that I have now described, and that in which there is no necessity for removing any portion of skin. Where none of the skin is removed, the divided teguments on being drawn together cover the fore completely; an adhesion commonly takes place over the whole; and the cicatrix that ensues is inconsiderable: But when any portion of skin is removed, a fore is always left, which not only renders the cure tedious in proportion to the quantity of skin that is taken away, but the cicatrix is necessarily of the same size; by which much tenderness and irritability is left in the site of the disease, which I am convinced has often some influence in making it return.

The fore that remains after the operation, should be treated with the mildest dressings.

dressings. When any hemorrhagy takes place from the surface of the sore, and is not removed on the larger arteries being secured with ligatures, dry lint should be applied for the first dressing; but for all the after-dressings, lint covered with any emollient ointment should be preferred. Mild emollients never give pain, which dry lint is very apt to excite; and they certainly admit of a more quick formation of granulations than any dressings that give irritation.

I have hitherto been supposing that the disease occupies the mamma only; but the lymphatics leading from the breast to the armpit are also often indurated, and likewise the glands in the armpit itself. In some instances, too, a number of diseased glands are found to run from the breast to the clavicle, and to spread in considerable clusters along both the upper and under edges of that bone.

In such circumstances, the amputation of the mamma itself must be managed in the manner I have already advised; but
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besides this, an incision should be made through the skin and cellular substance from the further extremity of every cluster of hardened glands, and made to terminate in the principal cut produced by the removal of the mamma. Thus, when the glands in the armpit are enlarged, although they might frequently be pulled out either separately or connected together, by a hook insinuated below the sound skin at the sore in the breast; yet it answers the purpose better, to lay the glands first bare by an incision in the manner I have advised, and then to dissect them cautiously out with the scalpel. In the course of the dissection, a good deal of assistance may be obtained from passing a strong ligature through the largest gland; by which the whole cluster with which it is connected may be elevated from the parts below, so as to admit of their being more easily cut out with the scalpel: And it often happens, that these indurated glands run so near to the axillary artery, as to render it highly proper to use every probable

probable means for rendering the dissection safe and easy.

In like manner, when a cluster of diseased glands is found to extend towards the clavicle, or in any other direction, after the teguments have been freely divided, the glands themselves should be totally removed; and both here and in similar affections in the armpit, the divided teguments should be brought together, and retained in their situation, either by means of compression alone, or, when this is not sufficient, by the introduction of one or more sutures.

The point that I more especially wish to inculcate respecting this operation is, the propriety of saving as much skin as possible. The necessity of this had rarely, if ever, occurred to our forefathers: And accordingly the common practice has been, to remove all the skin corresponding to the morbid parts underneath: By which much unnecessary pain is produced; a very extensive and ugly sore is left; and the cure is always tedious. In-

stead of which, although it may not in every instance be practicable by the means that I have advised, to cover the fore entirely with skin; yet, in all cases, a considerable part of it may for certain receive this important advantage; by which the extent of the fore will be much diminished; a cure will be proportionally sooner effected; and by the cicatrix being less extensive, the risk of the patient in future will probably be less also.

The propriety of saving as much skin as possible, not only in this operation, but in every other where an extensive fore is commonly left, particularly in amputating the extremities, has always appeared to me to be a matter of such importance, that, from the time of my entering on the operative part of business, I have taken all opportunities of putting it in practice. Ever since the year 1772, I have managed cancerous breasts in the manner I have now mentioned, that is, by endeavouring to save as much skin as possible; and the advantages

advantages derived from it have been very considerable.

Till of late, the only means put in practice for securing the skin in its situation, so as to effect an adhesion between it and the parts underneath, was compression by the napkin and scapulary bandage, excepting in a few cases in which adhesive plaisters were employed. But as ligatures give very little pain, and as they retain the parts more certainly in their situation, I now employ two, three, or more, according to the extent of the divided parts; and they always answer the purpose.

CHAPTER XXI.

Of the PARACENTESIS of the THORAX.

SECTION I.

General Remarks on this Operation.

THE operation of the Paracentesis, or Tapping the Thorax, is always indicated where the action of the heart or lungs is much impeded by fluids collected in the cavity of the chest.

Hitherto this operation has been supposed to be applicable to the evacuation of water or of pus only ; chiefly of the latter, in the disease termed Empyema. But I

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am clearly of opinion, that it is equally proper for the discharge of any other fluid as for collections of water or purulent matter.—The symptoms induced by collections of different fluids, may vary according to the nature of the disease, or of the accident giving rise to their formation. But it is their effect on the motion of the heart and lungs, to which practitioners ought chiefly to attend; and this will always depend more on the quantity than on the kind of fluid that is collected.

The different kinds of fluids met with in the thorax, and requiring to be drawn off by this operation, are serum, blood, pus, and air.—Of these I shall treat in separate sections.

SECTION II.

Of Serum collected in the Thorax.

COLLECTIONS of serum in the chest are frequently combined with dropy in other parts: But we often meet with it as a local affection; and it is in this case chiefly, that any advantage is to be expected from a chirurgical operation.

Independent of general effusions into the two large cavities of the thorax, dropical collections are also met with in the pericardium, and in some instances they are confined to the mediastinum immediately below the sternum.

Various and distressful symptoms accompany these collections, but it requires much attention to ascertain their existence, and especially their particular situation, with such precision as can warrant an operation of such importance as the paracentesis of the chest.

A patient who complains of a sense of weight or oppression in the thorax; of difficult respiration; of more uneasy sensations in one side of the chest than in the other; of being liable to sudden fits of starting during sleep, from fear of immediate suffocation; and if, along with these, he is distressed with a frequent cough; if the pulse is small and irregular; and if a dry skin, scarcity of urine, swelled limbs, and other symptoms of dropfy take place, little doubt can remain of water being collected in some part of the chest. A sense of undulation, as of water passing from one part of the breast to another, is sometimes observed by the patient on rising suddenly from a horizontal posture; and this, I may remark, serves not only to assist in ascertaining the real nature of the disease, but to determine in what particular part of the chest the water is collected. Much attention, therefore, should be given to this circumstance; for by means of it we may commonly determine, with some pre-

cision where a perforation ought to be made.

That every possible advantage may be derived from this circumstance, the patient should have his chest uncovered while under examination. When the quantity of collected serum is considerable, it may commonly be discovered by placing one hand upon the anterior part of the ribs near to the sternum, and striking with some force near to the backbone with the other; and if an induration is perceived in one side of the chest and not in the other, the seat of the disease is thereby obvious. But when the quantity of fluid is not great, this trial is not to be trusted. In this case, a person standing behind the patient upon a chair, should be directed to take a firm hold of the upper part of his body, and to swing it repeatedly by sudden jerks from one side to another; and if water is contained in the chest, it will thus be very certainly found to undulate, and an evident noise will arise from it. I have met with
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different instances of this, in which the existence of the disease was thus precisely determined.

In long-continued collections of serum, assistance in the diagnosis is sometimes obtained, from the part in which the water is seated being more prominent than the rest of the chest. It has even been alleged, that all the ribs of one side of the thorax have, in some instances, been found obviously elated, by the water being in such quantities as to prevent them from contracting in the act of expiration. This can only happen in the very late stages of the disease ; but wherever it takes place, it shews with certainty where the water is to be looked for.

When the disease is in the pericardium, nearly the same symptoms take place with those which droply produces in other parts of the chest. The most accurate observation indeed will sometimes fail in judging of this ; but in the hydrops pericardii, it is observed, that the patient complains chiefly of the middle and left
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side of the thorax : And Senac, in his excellent Treatise on the Structure of the Heart, mentions as a characteristic mark of this disease, a firm undulatory motion being perceived between the third, fourth, and fifth ribs on every pulsation of the heart.

As it is not in any respect necessary to enter minutely into the investigation of the causes of these collections, all that I shall say respecting it is, that whatever tends to produce dropsy in other parts of the body, will have a similar effect in forming it here.

The existence of water in the thorax being ascertained, and the part in which it is collected being discovered, if the medicines employed in the cure shall fail, and if it is evident that the patient must die if the operation is delayed, it ought certainly to be advised without farther delay : Perforating the thorax is no doubt an important operation, and it ought not to be advised but in real danger. I do not however hesitate to say, that it should be performed in every instance where the attending

tending symptoms are hazardous, and cannot be removed by other means ; and the method of doing it is this :

The patient should be laid in a horizontal posture, with the side in which the perforation is to be made laid over the bed : When in this situation, the skin over the whole side on which the opening is to be made, should be pulled upwards by an assistant, by whom it should be preserved in this situation during the operation ; and the surgeon should now, with a scalpel, make an incision two inches in length between the sixth and seventh ribs, in the very direction of these bones, and at an equal distance between the sternum and backbone, taking care to avoid the under border of the superior rib on account of the bloodvessels running in its groove. But although it is necessary, in order to obtain sufficient room for the scalpel, to have the opening in the skin and cellular substance of this length, there is no reason for continuing it of the same extent
to

to the bottom ; so that, as the knife passes through the intercostal muscles, the incision may in a gradual manner be shortened to the length of an inch. On the pleura being laid bare, it should be slowly and cautiously divided, in order to avoid all risk of wounding the lungs, lest they should at this place happen to adhere. If they do not adhere, the water will rush out with much force as soon as an opening is made in the pleura ; but if the pleura adheres to the lungs at this place, the incision must either be carried forward to an inch or two nearer the sternum, or another opening will be required, either an inch or two higher or lower in the thorax. As soon as water is found to flow, the silver canula, Plate LVIII. fig. 6. should be introduced at the opening ; by which means the discharge will not only be more easily completed, but will likewise be more readily stopped, if this should be found necessary, by the patient becoming faint. By doing it in this manner, air is prevented from finding access to the cavity of
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the chest; a circumstance of some importance in this operation.

When the water collected is not in great quantity, it may commonly be all drawn off at once; but as from the structure of the thorax, we are deprived, during this operation, of the advantage of compression, except of that which may be communicated through the abdomen, which must here be very limited, when much water is collected, partial evacuations ought to be made, at longer or shorter intervals according to circumstances. For this purpose, and with a view to give a temporary suspension to the discharge, the canula should be secured by a ribbon connected with it tied round the body of the patient, and stopped from time to time with a piece of cork adapted to its opening. A pledget of emollient ointment should be laid over the wound; and the whole being secured with the napkin and scapulary bandage, the patient should in this state be laid to rest. After a suitable delay of a day or
two,

two, an additional quantity of water may be drawn off; and by thus taking it away in a gradual manner, all risk may be avoided of the patient being injured by the discharge being too sudden.

In this manner any quantity of water contained in the chest may be drawn off with safety; and the patient being now relieved from the great distress under which he laboured, the canula may be withdrawn, proper means being at the same time employed for preventing a relapse of the disease.

I have hitherto supposed, that the serum is collected in only one of the cavities of the chest; but when both sides are affected, it cannot be all drawn off by one operation. In this case, therefore, after being drawn off from one side, the operation should be repeated in the other; but some risk might occur from performing it in both sides at nearly the same time, by the external air getting access at once to both cavities of the chest: For although I have advised the opening in the
pleura

pleura to be small, and a canula to be immediately passed into it, yet still it is impossible, even with the utmost caution, to prevent the air from finding access, either by the wound or canula, to the surface of the lungs; and if both cavities of the chest should at the same time be filled with air, nearly the same oppressed state of respiration would take place as was produced by the serum newly discharged. Before the operation, therefore, is repeated on the opposite side, some means should be advised for expelling the air received into the cavity of the chest by the first perforation. This may be done in different ways; the most easy and convenient of which is this: Immediately after the canula is withdrawn, let the patient endeavour, as far as he dare safely venture, to fill the lungs with air. This will expel a considerable part of what was collected between the pleura and lungs, by the perforation; and if the skin, which was retracted before the operation, be instantly drawn over the sore, and pressed down
by

by an assistant during inspiration, all access will thus be prevented to the external air; and by this being frequently repeated, almost all the air collected between the pleura and lungs will be expelled: After which the skin must be drawn over the wound; and by means of a compress and bandage properly applied, the parts may be made to adhere without further trouble.

Air may also be drawn off from the thorax in the following manner: Let an exhausting syringe be fitted with such a mouth of ivory or metal as will allow it to be closely applied over the opening in the pleura. When thus applied, every stroke of the piston will extract a considerable quantity of air; and as soon as the whole is supposed to be nearly exhausted, the instrument may be removed, and the wound treated as I have already advised, by drawing the skin over it, and endeavouring to heal it by the first intention.

Or, instead of an exhausting syringe, one of the elastic vegetable bottles, fitted

ted with the same kind of mouth, may be employed. By expelling all the air out of the bottle, and applying the mouth of it over the wound in the pleura, a quantity of air nearly equal to the bulk of the instrument will be extracted, and it may again be applied as often as is necessary; care being taken at each removal of the instrument to exclude all access to the air, by drawing the retracted skin over the wound.

Air collected in either of the cavities of the chest, may not only prove hurtful by impeding the motion of the lungs, but it must likewise do harm by that tendency to inflame, that is commonly given to parts naturally secluded from the air, from their being by accident laid open so as to admit of air being freely applied to them. In all such cases, therefore, this circumstance merits particular attention. When one side only of the thorax is laid open, either in collections of water or matter, the oppression produced upon the lungs by the admission of air, is not commonly of much importance, as for the most part

it is expelled by exspiration alone. This I know from experience is the case; but inflammation, as I have already observed, being sometimes induced by air finding access to these cavities, it ought at all times to be rigidly guarded against; and, as much distress has been induced from both cavities of the chest being laid open at once, it ought never to be attempted.

Our views in what I have ventured to advise in the different steps of the operation, will appear, I hope, sufficiently obvious; but as some surgeons prefer a different part of the chest, as well as a different instrument, for performing the operation, I think it necessary to consider these points somewhat more minutely.

It has been said, that unless the opening is lower in the chest, the water will not be completely discharged, as all that part of the cavity that lies below the wound will still continue to be filled with it. But, if the patient is laid in a horizontal posture, with his body inclined to the side in which the perforation is made,
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the spot that I have advised will be found to be more depending than any other; and in this situation we have this material advantage, that the lungs do not so readily adhere to the pleura, as they do farther down, where they come more closely into contact with the diaphragm; and here too, the perforation is made with more ease than it can possibly be nearer the spine, where the thick muscles of these parts cannot be avoided.

With respect to the instrument with which the operation is performed, the scalpel, I think, is the best. A trocar has been recommended by many: But however well adapted a trocar is for piercing the abdomen or scrotum, in which none of the contained parts can be hurt if the operation is rightly performed, yet in the thorax much risk must attend the use of it from the adhesions which often take place between the lungs and pleura, and from our not being previously able to determine whether they adhere or not at the very point in which the perforation is made.—

In the event of no adhesion being met with, the trocar would no doubt accomplish the intention of the operation, and with perfect safety if cautiously introduced. But if it should unfortunately be inserted where adhesions between the lungs and pleura take place, the lungs would not only be injured, but the operation would not answer the purpose; for the instrument entering the substance of the lungs, it would not come into contact with the water collected between the lungs and pleura lining the ribs, and consequently no discharge would ensue. With the scalpel, this inconvenience is avoided: On the pleura being laid bare, a small hole should be scratched in it with the point of the scalpel; and as soon as this membrane appears to be penetrated, if no serum is discharged, there will be much cause to imagine that the lungs adhere at this place; and the surgeon will now either desist entirely, and make an attempt in another situation; or if the adhesion between the lungs and pleura is slight, which may be known

known by the cautious introduction of a blunt-edged probe, as much of them may possibly be separated as to allow the canula to pass into the collection of serum: At least this trial may at all times be proposed. If the lungs are easily separated, and if the adhesion is not extensive, the operation will thus be completed; while if the contrary shall ever be the case, the operator will at least have the satisfaction to think that he has done no mischief, which he might not in such circumstances have been able to avoid, if a trocar had been used. After duly attending, therefore, to every circumstance, I am clearly of opinion, that the scalpel should in this operation be preferred to the trocar.

When the disease is seated in the pericardium, it is in some instances so much distended, that on examination, it is easily distinguished. Upon making an opening in the left side, between any two of the ribs from the third or fourth to the seventh or eighth, and within the distance

of five or six inches of the sternum, we can never fail in this distended state to meet with it ; and when brought fully in view, by the pleura being freely divided for the space of an inch or two, the best method of finishing the operation, is to push a small trocar into the pericardium. If the quantity collected is small, it may all be drawn off at once ; but when considerable, the discharge should be frequently stopt for a few minutes together, with a view to prevent those inconveniencies which might ensue from giving a sudden and free flow to the whole quantity.

When, again, serum is collected in a cyst between the lamellæ of the mediastinum, as it is situated immediately below the sternum, any pain or oppression which it excites, is more confined to the centre of the breast, than we find it to be when the collection is seated in either of the cavities of the chest ; and for the same reason, any opening intended to discharge it, must be made directly through the sternum itself, by a piece of that bone being
taken

taken out with the head of a trepan, so as to admit of the seat of the disease being laid in view. The method of applying the trepan I need not enter upon at present, as the operation has been already described in a preceding Chapter. All that I need farther say upon the subject is, that as soon as the cyst containing the fluid is laid bare, a perforation should be made into it with a trocar; care being taken to manage the discharge in the same cautious manner I have already advised, and not to allow the parts newly laid open to be more exposed to the air than is necessary.

SECTION III.

Of Blood collected in the Thorax.

WHEN blood is collected in large quantities in any part of the chest, the breathing becomes oppressed, and the motion of the heart and arteries feeble and irregular. These, indeed, are symptoms which occur in every collection seated in the thorax; but they arrive at a greater and more distressful height from blood, than from collections of other fluids. In other circumstances, the symptoms arising from blood and serum are so similar, that they need not again be enumerated.

Blood may be effused in the cavity of the thorax by different causes, and of these the following are the most frequent.

I. Wounds that penetrate any of the bloodvessels in the thorax.

2. The spiculæ of a fractured rib, and splinters of the sternum and vertebræ, sometimes injure the bloodvessels in the thorax.

3. These vessels are sometimes eroded by the matter of an ulcer or of an abscess; and,

4. They may be ruptured by any violent exertion, particularly in the action of coughing.

As it commonly happens, where blood is collected in the chest, that the vessels from whence it is discharged are seated in the substance of the lungs, part of the blood is usually brought up by the mouth in a fit of coughing; and when the quantity discharged in this manner is considerable, it gives relief to the oppressed state of the lungs as well as of the heart; but whenever the action of either of these organs becomes much impeded by a great accumulation of blood, some attempt should be made to draw it off by a perforation: And as blood, when extravasated, coagulates quickly, and cannot in this
state

state be easily discharged, an opening should be made for this purpose as soon as from the symptoms there is cause to imagine that it is beginning to stagnate.

When the blood is found to be so firmly coagulated as not to pass off by a perforation, it has been proposed to dissolve or to dilute it by injecting warm water or emollient infusions. This, however, is a practice that ought seldom to be advised; for injections, even of the mildest kind, must in this situation be always attended with risk; but when it so happens, that much blood is collected in a coagulated state, and that it cannot be drawn off even by enlarging the opening in the pleura as far as can with propriety be done; and as much hazard would be incurred by allowing it to remain, even a doubtful remedy in such circumstances becomes eligible.—In this situation, by frequently and cautiously injecting tepid water, the coagulated blood may be gradually so much softened and dissolved as to be at last discharged. But
when

when we have it in our power to make a choice, it will be much for the interest of our patient, to prevent the necessity of this remedy, which for the most part may be done by making an incision in the manner I have advised, in that part of the thorax where the blood appears to be collected.—By some practitioners, particularly by Mr Sharpe, we are advised, in cases of blood collected in the chest, rather to trust to its being absorbed or coughed up from the lungs, than to endeavour to draw it off by this operation *.—Where blood is either extravasated in the substance of the lungs, and is freely spit up, or when collected in any of the cavities of the chest, and in such small quantities as to produce no material impediment to the action of the lungs or heart, it would no doubt be improper to advise it to be discharged by an operation, as in course of time, by blood-lettings being frequently repeated according to the strength of the patient ;

* Treatise of the Operations of Surgery, chap. xxiv.

patient; by the effect of a low diet, and other remedies usual in such cases, there will be cause to hope that it may be absorbed; and in the mean time, while the quantity of extravasated blood is inconsiderable, no material inconvenience can arise from it. But what I wish to inculcate is, that when such a quantity of blood is collected in either of the cavities of the thorax, as to disturb the functions of the organs contained in it, it ought to be drawn off by a perforation. It is said by Mr Sharpe, that, by allowing the blood to coagulate in the chest, the orifice from whence it is poured will be more readily stopt, than if it were quickly discharged. But in answer to this, I must remark, that if the wounded vessel is not large, little or no additional risk will be incurred by drawing off the blood as it is poured out, as in this case the hemorrhagy will probably stop on the patient's becoming faint: And on the contrary, if the divided vessel is large, the remedy proposed by Mr Sharpe will not be sufficient for the
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the purpose; for a wound in any of the large vessels of the breast, will probably prove fatal, whether the operation of the paracentesis is performed or not.

The directions that I have given for discharging serum collected in the thorax, will, in general, prove equally applicable for the evacuation of blood: only, when the collection is produced by a ruptured bloodvessel, induced either by a fractured bone, or by some extraneous body pressed into it, the incision should be made as contiguous as possible to the part affected, so that the opening may serve not only for discharging the blood, but for extracting such portions of bone as are found to be detached, or any foreign bodies that may be met with. And again, when a wound with a sharp-pointed instrument is the cause of the collection, instead of perforating any other part of the chest, it will commonly answer the purpose better, merely to enlarge the wound; at least, this will always be preferable, in wounds of the inferior part of the thorax; but
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when seated so high in the chest, as to be unfit for discharging the blood contained in it, the operation in that case should be performed between the seventh and eighth ribs, in the manner I have already advised.

S E C.

SECTION IV.

Of an Empyema, or a Collection of Purulent Matter in the Thorax.

THE marks of oppression on the heart and lungs produced by purulent matter collected in the chest, are very similar to those which proceed from serum, but in collections of pus, symptoms take place which direct our opinion, not only in regard to the nature of the disease, but in pointing out the spot in which it is seated.

It has been asserted, that pus is sometimes deposited in particular parts without any previous inflammation. But this is so very uncommon, that we may lay it down as a fixed principle, that inflammation is a necessary forerunner of purulency; so that an empyema can never be met with, but as a consequence of an inflamed state of a particular part. When, therefore,

fore, such symptoms take place, as indicate the existence of a fluid in the thorax, if they have not been preceded by inflammation, we conclude that they are not induced by purulent matter. But when a patient who has for some time complained of a fixed pain in some part of his chest, attended with heat, a quick pulse, and other symptoms of inflammation, is at last seized with oppressed respiration; an inclination to sit in an erect posture; with a total inability of lying on the sound side; a constant tickling cough; frequent rigors or shiverings; and especially if these symptoms are accompanied with an enlargement of the affected side, or with a soft œdematous fulness of the part in which the pain was at first seated; we may conclude with much certainty, that a large collection of matter is formed.

Inflammation of some portion of the lungs, or of their coverings, may be induced by various causes. In some instances, families appear to have an hereditary tendency to tubercles in the lungs; which

which every flight attack of cold is apt to affect with inflammation. A natural contracted state of the thorax seems likewise to predispose these parts to inflame; and inflammation may be produced here, in the same manner as in other parts of the body, by every variety of external violence.

But by whatever means the contents of the chest may have become inflamed, when this terminates in suppuration, if the matter, instead of being freely discharged by the mouth, as is frequently the case, is found to produce all the symptoms that I have already had occasion to enumerate of oppressed respiration, the only remedy upon which any dependence can be placed, is a perforation.

Practitioners have in general considered this operation as more hazardous than it really is; and it has been said, that it ought never to be advised, but when the seat of the abscess is clearly pointed out by an external swelling between two of the ribs. When the lungs become infla-

med in a part that adheres to the pleura, abscesses may form there ; and when discovered, they should no doubt be laid open. But although the operation for the empyema, as it is commonly termed, is of some importance, and should never be employed but when indicated by necessity ; yet I am not of opinion that it can ever be attended with so much risk as to render the formation of an external abscess the only cause for performing it. When there is reason to think, that previous inflammation in some part of the breast, with evident marks of its having terminated in suppuration, is the cause of oppressed breathing, and when the symptoms are not speedily relieved by a free expectoration of matter, the operation of the paracentesis should be performed immediately on that spot where the collection is supposed to be seated, whether any external marks of an abscess exist or not. It may frequently happen, that no matter will be discharged on the perforation being made into the chest, for we know from experience, that

that abscesses are often seated in the substance of the lungs, and not in either of the cavities of the chest. But, even in such instances, the perforation may prove useful, as the lungs, by losing their usual support at a particular point, will more readily yield than they otherwise would do to the matter collected in them: while, if the matter is already poured into the cavity of the chest, a perforation being made into it, is the only remedy that can save the patient, I am therefore clearly of opinion, that, in all such cases, the paracentesis of the thorax should be advised.

The directions given in the two preceding sections, for conducting the perforation, will apply with equal propriety in collections of pus: Only, it must be remarked, when the seat of an abscess is pointed out, either by a long continuance of pain in any one point, or by matter being distinguished between two of the ribs, that this is by much the best direction for the place of the incision. But when no such mark is met with, the place

that I have advised for the operation when water or blood is to be discharged, will answer equally well for the discharge of matter.

It is likewise necessary to observe, that, in purulent collections proceeding from external injuries, particularly from penetrating wounds, no operation can be necessary, if the wound by which the abscess is produced is so situated as to discharge the matter; but when the wound is found to be too high in the thorax for answering this purpose, an opening in a more depending place becomes necessary; and again, when the matter is seated so immediately below the sternum that it cannot be discharged by an opening between two of the ribs, a piece of that bone must be removed with the trepan, as I have already advised, when speaking of collections of serum.

In abscesses of these parts, the matter is commonly first formed in the substance of the lungs, and afterwards discharged into one or other of the cavities of the chest.

It

It sometimes happens, however, that large quantities of pus form between the pleura and surface of the lungs, without any apparent affection of that organ; and seem to proceed from an inflamed state of the surface of the pleura. These collections, however, seldom continue long without producing ulceration; and when ulceration has taken place, the discharge of matter that succeeds to the operation of the paracentesis generally continues for a great length of time.

Different causes concur to render the cure of abscesses in the cavity of the chest tedious: The constant motion of the lungs; our not daring to induce that degree of inflammation that we know to act powerfully in producing a reunion of parts that have been divided by the formation of matter; and the effect of compression being precluded by the intervention of the ribs. Although, in a few instances, the quantity of matter gradually becomes less, and the external opening contracts and heals, yet, from the causes I have men-

tioned, in a great proportion of those who have undergone the operation for the empyema, or who have had large collections of matter in the breast, as the effect of accidental wounds, the discharge continues for a great length of time, most frequently for life. The sore, indeed, will often heal, if it be not artificially kept open; but the matter almost constantly bursts out again, or another operation becomes necessary to discharge it, when it collects again in such quantities as to produce a renewal of the symptoms of oppression on the lungs and heart.

I have already had occasion to advert to this subject when treating of wounds of the thorax, in Chapter III. Section XI. At present, I only think it necessary to observe, that although, in the treatment of wounds, the general use of tents, whether solid or hollow, has been condemned with much propriety; yet that we are evidently misled by fashion, when we lay them entirely aside in wounds that penetrate the breast. I know that it is the opinion
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of many practitioners, that tents of every kind should be exploded ; but I also know, that patients who might otherwise have been saved, have frequently suffered by this rule being too generally followed. As long as the matter of an abscess in the thorax continues to find an easy vent, and is discharged freely, either by the wound by which it was produced, when this is sufficient for the purpose, or by a perforation made for drawing it off, when this is found to be necessary, there can be no cause for employing tents ; and in such circumstances, indeed, it would be improper to use them. But when the opening in the thorax heals too quickly ; when, in consequence of this, the matter does not find a free vent, and symptoms of oppressed breathing supervene ; in such circumstances, the propriety of preserving a passage for the matter is obvious. Repeated experience has convinced me, that this may be done both with ease and safety, by introducing a short tube of gold, silver, or lead, into the opening, and allowing it

to remain for a few hours, as often as a tendency to heal makes it necessary. By neglecting this, and allowing such sores to heal, as now commonly happens, much mischief is done, which, with this kind of attention, might be easily prevented.

S E C-

SECTION V.

Of Air extravasated in the Thorax.

AIR collected in either of the cavities of the chest, excites the same symptoms of oppression on the lungs and heart, as those arising from water, blood, or matter; it therefore becomes equally an object of chirurgical management.

Collections of air may be produced in the thorax by different causes.

1. As the process of putrefaction tends to extricate air from every part of the body in which it takes place, air may be collected in the thorax, from any of the organs contained in it being seized with mortification. This variety of the disease, however, will seldom fall under the care of the surgeon; for the cause by which

it is produced can scarcely be supposed to yield to any remedies that may be employed for it; and unless the mortification is removed, no benefit could result from any operation.

2. Air may pass into one or both of the cavities of the chest, from a rupture of the investing membrane of the lungs, and this again may occur from violent exertion in coughing, laughing, and crying, as well as from other causes.

3. The surface of the lungs may be eroded by ulceration, or by purulent matter in contact with them becoming acrid, by which a passage may be given for air into one or other of these cavities.

4. Wounds penetrating the lungs have sometimes produced collections of air in the chest; but in such instances, the wound must be made with a small-pointed instrument pushed in an oblique direction. A wound produced by an instrument carried forward in a direct line into the lungs, does not readily produce collections of air, as the air that escapes
from

from the lungs passes out at the wound : But in oblique wounds, the air does not easily escape, as the parts naturally fall together ; in which state they operate in the same manner as a valve, so that the extravasated air must necessarily collect in one or other of the cavities.

5. The point of a fractured rib wounding the lungs, is apt to induce collections of air in the thorax ; and a fracture of the sternum, or of any of the vertebræ, may be attended with the same effect.

These several causes may occasionally produce extravasated air in the thorax ; but we meet with it more frequently from fractures of the ribs than from any of the others.

The symptoms produced by air effused in the thorax, differ only from those that occur from serum and purulent matter, in their arriving more quickly to an alarming height : Instances have occurred of death being induced in the space of a few hours from the fracture of a rib, merely by air collecting in large quantities

tities between the pleura and lungs: In some, perhaps in the greatest proportion of all that occur, along with this collection of air in the chest, the cellular substance of the breast becomes inflated; and if means are not soon employed to prevent it, the air insinuates through every part of the body.

It is truly astonishing to observe, how quickly a fractured rib, when it wounds the surface of the lungs, will in some instances induce the most alarming symptoms.—The patient at first complains of tightness in the breast, attended with oppression in breathing, along with pain in the parts chiefly affected.—This difficult respiration becomes more distressful.—The patient cannot breathe in a recumbent posture, and is always easiest when erect and leaning somewhat forward:—The face becomes flushed and swelled:—The pulse is commonly feeble, and at last it becomes irregular:—The extremities become cold; and if relief is not quickly obtained,

obtained, the patient is at last carried off with every mark of suffocation.

The emphysematous swelling of the external parts of the chest, which sometimes takes place here, is easily distinguished from watery effusions, by the crackling produced on pressure ; the sensation it communicates being nearly such as is received from pressure upon a dry bladder when nearly filled with air. For the removal of this symptom, scarifications have been employed. By making several incisions, each about half an inch in length, along the course of the swelling, a good deal of air may be discharged, especially if the air contained in the swelling is frequently pressed towards these openings. A considerable quantity, too, of the air collected in the thorax, will be drawn off by the same means : For, as soon as any part of it passes off from the cellular membrane, its place will be immediately supplied from the chest ; and if the quantity that escapes by the wound in the lungs, is not greater than the quantity discharged

charged by the scarifications, the whole in this manner may soon be removed. But it frequently happens, that the air forced out from the lungs is much more than can pass off by any number of scarifications that can be made; in which case, any relief that takes place in the oppressed state of respiration, is commonly inconsiderable.

Till of late, patients in this situation almost constantly died; for when scarifications failed in discharging the air, and even this remedy has not been long in use, practitioners were not acquainted with any other means of relief.—But we now know, that in all such cases, where the oppressed state of breathing is great, and the symptoms are evidently induced by air collected in the chest, that the same remedy should be employed for removing it, as is found to succeed in collections of any other fluid, *viz.* the operation of the paracentesis; and it has accordingly, of late years, been frequently performed, and always with complete success; the
tension

tenfion in the breaſt, difficulty of breathing, and every other ſymptom being immediately relieved on a perforation being made through the pleura *.

With a view to prevent the inconveniencies that reſult from the external air finding acceſs to the cavities of the cheſt, it has been propoſed to make the opening with a trocar inſtead of a ſcalpel; and by entering the inſtrument in an oblique direction, this purpoſe would no doubt be answered.

When the cheſt is completely filled with air, and if certainty could be obtained that no adhesions exiſted between the lungs and pleura, the operation might be performed with ſafety, and with more eaſe by the trocar than with any other inſtrument. But as we can never know with precision whether the lungs adhere or not, I am, for theſe and other reaſons
mentioned

* This operation for the evacuation of air from the cheſt was firſt propoſed by Dr Monro, about the year 1760, in his lectures in this Univerſity.

mentioned in a preceding part of this chapter, induced to think that the operation may be done with more safety with the scalpel. And if the directions that I have given are observed, of retracting the skin from the part to be perforated; of introducing a canula immediately into the opening in the pleura, as soon as air begins to escape; and drawing the retracted skin over this perforation into the chest, as soon as the canula is withdrawn, the operation may be done with more certainty of avoiding the lungs, in the event of their adhering to the pleura, and probably with more success in every respect, that when the trocar alone is employed.

The practice, therefore, that I would incline to follow, is, in the first place, to make several incisions along the course of the swelling, each of a half inch in length, and of such a depth, as to pass entirely through the skin into the cellular membrane: And, if these do not afford relief, which, however, they frequently

quently do, to proceed immediately to perforate the cavity of the chest in the manner I have advised, and as near as possible to the injured part, when the malady has been induced by external violence, if this be not near to the backbone; in which case the perforation should be in the most depending part of the thorax, as I have already advised in collections of water, blood, and matter. And when produced by violent exertion in coughing, crying, or laughing, the particular seat of the complaint will in general be discovered by some degree of pain in the injured part.

CHAPTER XXII.

Of the Paracentesis of the Abdomen.

IT is the effect of various diseases to produce collections of fluids in the cavity of the abdomen: Occasionally these collections are removed by the internal exhibition of medicines, though in a great proportion of cases, we are obliged to employ the operation of Paracentesis or Tapping.

There is naturally secreted into the cavity of the peritonæum, a serous exhalation, for the purpose of lubricating and keeping moist the surface of the intestines. Various causes may concur to produce a morbid increase of this secretion; and whenever the quantity collected in the abdomen is large, it constitutes a disease termed Ascites.

This

This variety of dropſy often accompanies a general diſeaſe of the ſyſtem, being frequently combined with anafarca; but in ſome inſtances it is local, and is evidently induced by compreſſion of the lymphatics; moſt frequently by ſchirrous ſwellings of ſome of the viſcera; commonly indeed by an enlarged ſtate of the liver.

The preſence of a fluid in the cavity of the abdomen, is known by the ſwelling that takes place; by a ſenſe of tightneſs all over the belly; by the breathing being difficult and laborious, when the patient is in a horizontal poſture; and by a ſenſe of fluctuation being communicated to the fingers placed on one ſide of the belly, when it is forcibly ſtruck on the other. A concurrence of theſe circumſtances will always, to a diſcerning practitioner, point out the real nature of the diſeaſe; but a further confirmation is obtained of it when the patient complains of much thirſt, a dry ſkin, ſcarcity of urine, and other ſymptoms of dropſy.

When the swelling is found to extend equally over the abdomen, the serum is commonly diffused among the different viscera, and is contained within the peritonæum only. It sometimes happens, however, that it is collected in different cysts, or perhaps in one or both of the ovaria; in which case, the tumor is not commonly so equal, nor the fluctuation so distinctly perceived, as when the water flows freely through the whole cavity. This circumstance of fluctuation depends also on the consistence of the fluid; for, we sometimes find it thick and gelatinous, whilst most frequently it is thin and perfectly serous. In some instances, too, an innumerable quantity of small hydatides are found swimming in the serum of ascitical swellings, by which the fluctuation is commonly made obscure.

Whatever may be the influence of diuretics and other evacnants in the cure of general hydropic swellings, they rarely prove useful, as I have elsewhere observed, in local collections. The principal object, therefore,

therefore, to be kept in view here is, to discharge the water collected in the abdomen, by a surgical operation, as soon as its existence is ascertained; while the most effectual remedies should in the mean time be employed for preventing a recurrence of the disease. This indeed is often impracticable: But, in some cases, cures are accomplished; and it would probably happen more frequently, if the fluid collected in the belly was more early discharged. In general, this is delayed too long; for the bowels must surely be greatly injured by being so long soaked in water, as usually happens in ascites, before the operation is advised. This, too, is the more improper, as the operation of tapping is in itself exceedingly simple. It excites little pain; and any danger attending it does not proceed so much from the nature of the operation, as from the constitution being, in general, much debilitated by the long continuance of the disease before it is performed; which renders it liable to consequences that other-

wife would not so readily occur, and which frequently terminate fatally. I am so perfectly convinced indeed of this, that I commonly advise the water to be drawn off as soon as a fluctuation is distinctly perceived ; and I have never been sensible of any harm being done by it.

In large collections of fluids, wherever they are situated, more particularly in the abdomen, the situation of a large proportion of bloodvessels, it is found to be exceedingly hazardous to discharge their contents suddenly ; owing, as we suppose, to the immediate influence produced upon the circulating system, by our thus depriving it too quickly of a support to which it had for a long time been accustomed.

But whatever may be the immediate cause of the symptoms resulting from sudden evacuations of this kind, the effect is always certain. Syncope often happens ; and death itself sometimes ensues from it. This, in former times, made tapping a hazardous operation ; and when the collection

lection was large, in order to avoid those inconveniencies that ensued from the water being all drawn off at once, it was done at different times, a day or two being commonly allowed to intervene between one operation and another.

This, however, proved very inconvenient and distressful; and by the frequent introduction of the trocar which thus became necessary, mortification of the wound, and other troublesome consequences, were apt to ensue.

The late Dr Mead, reflecting on the probable cause of those symptoms arising from the sudden discharge of large collections of water, was induced to try the effect of pressure upon the parts in which they are seated, as a substitute for the support of which they are deprived by the evacuation; and the success attending the practice has fully justified the ideas that he entertained of it; for when pressure is properly applied, almost any quantity of water that the abdomen can contain, may with safety be drawn off. It ought, how-

ever, to be applied with much equality, over the whole belly ; and continued without interruption for the space of several days after the operation.

Various means have been proposed for applying equal pressure in this operation ; but none of them answers the purpose so easily, and with so much effect, as a bandage invented by the late Dr Monro, represented in Plate LXII. fig. 2. Two different sizes of this bandage should be always in readiness ; so large as to cover the whole abdomen, and to press with equality upon every part of it.

It is not necessary to recapitulate the means used in former times, for discharging hydropic collections ; for they are now very universally, and with much propriety, laid aside ; the trocar being the only instrument at present employed for this purpose. This instrument, till of late, was always round, with a triangular point. As this form, however, is evidently ill calculated for an easy entrance of the instrument, an object of much importance

ance in the operation, I was led a good many years ago to the use of a flat trocar with a lancet point, represented in Plate LVIII. fig. 1. This has always answered the purpose properly ; but some improvements have been proposed upon it, by which it is made to enter with still more ease. In Plate LIX. fig. 2. I have delineated a very neat invention by Mr Andrée.—It has been objected, however, to this instrument, and I believe with good reason, that the canula, by consisting of two sides which fall together with some force on the stilette being withdrawn, may thus lay hold of a portion of intestine ; and if this should ever occur, much distress and even danger might ensue from it. In Plate LVIII. fig. 2. an improvement upon the trocar is given, to which no such objection occurs : It enters with the same ease as a lancet ; and the two sides of the canula, by not falling close together, can never injure the intestines.

In

In performing the operation, it has been said, that the opening may be made with almost equal propriety in any part of the inferior boundaries of the abdomen. This, however, is not the case: For, in the centre of the abdomen, immediately below the umbilicus, and in the course of the recti-muscles, it might fall upon the epigastric artery; and, if carried near to either of the ossa ilia, the intestines would more readily be hurt than if made nearer the navel. The safest and best part for the perforation seems to be, at a point lying at nearly an equal distance between the umbilicus and centre of the spine of the ilium. No large bloodvessels can probably be wounded here.—The abdominal parietes are not in this part entirely tendinous; but are somewhat fleshy, so that they more readily heal when wounded.—None of the intestines can in this situation be readily injured; and when the patient is laid in a horizontal posture, in which he ought always to be during the whole course of the operation, the point that I
have

have mentioned will be found to be more depending than perhaps any other.

The operation being determined upon, the method of performing it is this : The point in which the perforation is to be made, should be marked with ink ; and in applying the bandage, Plate LXII., one of the openings should be placed exactly opposite to this mark. The bandage being accordingly applied in this manner, and the straps being put through the buckles, and drawn somewhat tight, the patient should now be laid in a horizontal posture, with his head elevated, and the side to be perforated lying over the side of the bed. The surgeon is now to take the trocar in his right hand ; and fixing the head of the stilette in the palm of his hand, while his fore-finger directs the point of the instrument, he is now to push it forward till he finds that the end of the canula is entirely through the muscles, and lodged in the cavity of the abdomen ; which he may be certain is the case, when he finds no farther resistance to the stilette.

lette. The stilette is now to be withdrawn, and the canula allowed to remain as long as the discharge continues, care being taken to pull the bandage gradually tighter as the water flows off; or, if the patient, notwithstanding this precaution, shall become languid, a total stop should be put to the discharge for a few minutes, which is easily done by the surgeon placing his finger from time to time on the mouth of the canula.

It sometimes happens, that the discharge stops before the swelling is much diminished: When this is owing to a portion of omentum or intestine stopping the extremity of the canula, the discharge is easily renewed by inserting a blunt probe into it, so as to push back whatever may have plugged it up; or when the serum is thick and gelatinous, in order to effect a complete evacuation, it may sometimes be necessary to introduce a trocar of a larger size than that which was first employed. But when it proceeds, as is sometimes the case, from the serum being collected in
particular

particular cysts, no attempt of this kind will have any effect : In such circumstances, the canula must be withdrawn, and the wound being covered in the ordinary way with a pledget of any simple ointment, the operation may be renewed either immediately or on the following day, on the opposite side of the abdomen ; or if the swelling is confined to any other part of the belly, the perforation must be made in the most depending part of it, wherever that may be.

Dropfical swellings of the ovaria exhibit nearly the same appearances with encysted dropfies of any other kind : Only, in collections of this kind in the ovaria, the fluctuation of a fluid is not commonly very distinct ; and unless they are complicated with ascites, the swelling is commonly confined to one side of the abdomen.

The propriety of drawing off the water by a perforation, is here, however, equally obvious as in any other variety of the disease : That is, when we wish to diminish or remove the tumor, it must necessarily

rily be done in this manner ; but I think it right to observe, that, in dropfical fwellings in the ovaria, the difeafe does not increafe fo rapidly as in common cafes of afcites ; neither does it appear to injure the conftitution fo much, and the water not being in contact with the inteftines, we are not in this variety of the difeafe under the fame neceffity of advifing the perforation early.

The ferum being all drawn off, and the opening dressed in the manner I have advised, the bandage muft ftill be continued fufficiently tight for preventing thofe diftreffful feelings which the fudden difcharge of it would otherwife be fure to induce : And there is even reason to think, that the fupport which the bandage affords to the weakened parts may have fome effect in preventing a return of the difeafe ; but when, notwithstanding of this, and of fuch internal remedies as are employed, the water is again found to collect, the operation falls to be repeated whenever the fwelling becomes large.

Afcites

Ascites is perhaps the most frequent variety of tumor to which the abdomen is liable; but in some instances, instead of water, tumors of the abdomen are found to contain air, constituting a disease termed Tympanites.

The effect produced by this upon the breathing, is nearly the same as what ensues from collections of water; but the swelling itself is much more tense than the other, and affords to the touch and pressure nearly the same sensation as is received from a bladder filled with air.

In a great proportion of cases of tympanites, the air after death is found in the intestines; which, in some instances, have been inflated to a most enormous size. This I suppose to proceed from the intestines losing their tone; but there is another variety of the disease, in which the air is diffused in the cavity of the peritonæum, in a similar manner to water in ascites. I have seen one instance of this, and I have heard of another, which happened lately in this place; but in both, the air
was

was found to have escaped from a small hole in one of the intestines. I am therefore inclined to believe, that this variety of tympanites very commonly proceeds from communication having taken place between the alimentary canal and the cavity of the peritonæum; and therefore, that any remedies we can employ, must, where this is the case, be of no avail. But from whatever cause the disease may have arisen, and whether the air should be contained within the bowels themselves, or diffused in the cavity of the peritonæum, no doubt should be entertained of the propriety of discharging it, as soon as it appears to have brought the life of the patient into danger.

This may be easily done in the very manner I have directed for ascites; taking care to use a trocar of the smallest size, and to employ pressure in the same guarded manner as when the tumor is formed by water. For, as the air will by its pressure produce nearly the same effects upon the neighbouring parts as we find

find to arise from water, it is equally necessary to employ such a degree of compression after it is discharged as will obviate the effects of abstracting it. To perforate the abdomen for air collected in the intestines, is no doubt a very formidable operation, and ought not to be attempted but in cases of the greatest danger; but as death has often ensued from this variety of the disease, and of which I have met with different instances, I am clearly of opinion, when the remedies prescribed by the physician for removing it have failed, that the assistance of surgery should always be desired, rather than allow the patients to die in certain misery. The same remedy is frequently and successfully employed for discharging air collected in the stomach and bowels of other animals: We have much reason, therefore, to hope, that in the human species the same effects would result from it.

After the operation of tapping, whether in ascites or collections of air, we are commonly advised to rub the abdomen

from time to time with astringent spirituous applications. This can never do harm: It may sometimes serve to restore the tone of the integuments, and as the friction employed in it may tend to promote absorption, it ought never to be omitted. For the first two days after the operation, it cannot be employed, as during that period the bandage ought not to be removed: But this being elapsed, the bandage may be removed daily for about a quarter of an hour at once, for the purpose of rubbing the abdomen with camphorated spirit of wine, or volatile liniment; care being taken to preserve the body during the time of it in a horizontal posture, and to renew the application of the bandage as soon as the friction is over.

CHAPTER XXIII.

Of HERNIÆ.

SECTION I.

Of Herniæ in general.

THE term Hernia might with propriety be applied to every swelling produced by the dislodgement of parts from those boundaries within which in a state of health they are contained; but the term in its general acceptation, implies, a tumor produced by the protrusion of parts from the cavity of the abdomen.

The parts in which *Herniæ* usually appear, are the groin, scrotum, labia pudendi, the upper and fore part of the thigh, the umbilicus, and different points between the interstices of the abdominal muscles.

If the situation of these tumors is various, the viscera which they contain are still more so. Instances have occurred of the stomach, uterus, liver, spleen, and bladder, being found in them. But they most frequently contain a portion of the omentum or alimentary canal, and in some instances a portion of both.

From the situation and contents of *herniæ*, all the appellations are derived by which this kind of tumor is distinguished. Thus *Herniæ* are termed Inguinal, Scrotal, Femoral, Umbilical, and Ventral, from their appearing in the groin, scrotum, thigh, navel, or belly. When confined to the groin, a hernia is said to be incomplete, and is termed *Bubonocèle*; but, when the tumor reaches to the bottom of the scrotum, the rupture is then supposed to be complete,

complete, and the disease obtains the name of Scrotal Rupture, or Oscheocele.

When a portion of gut alone forms the tumor, it is called an Enterocoele, or Intestinal Hernia; when a piece of omentum only has got down, it is termed Epiplocele, or Omental Hernia; and if both intestine and omentum are down, is called an Entero-epiplocele, or Compound Rupture.

As all the abdominal viscera are apparently contained within the cavity of the peritonæum, and as it was judged to be impossible for that membrane to admit of such a degree of distention, as to surround tumors containing such large portions of the viscera as are sometimes pushed out, it was till of late imagined, that, at least in a great proportion of cases, the peritonæum is burst or ruptured; and from this the term Rupture seems to have been adopted: The opinion was farther confirmed, from its being observed, that in scrotal hernia, the protruded viscera were in some instances found in contact with

the testicle ; a circumstance, which it was supposed could not happen, if the peritonæum had not been previously ruptured.

Since the anatomy of these parts, however, was better understood, this circumstance, of parts protruded from the abdomen being in some instances found in contact with the testicle, is explained in a more satisfactory manner than on the supposition of a rupture of the peritonæum ; and as the nature of herniæ will be better understood by an anatomical description being premised of the parts concerned in their production, I shall, before proceeding farther, endeavour to describe them : The parts chiefly concerned in herniæ, are, the abdominal muscles ; the peritonæum ; testicles, and spermatic vessels.

The fides and other fleshy boundaries of the abdomen are formed by five pair of muscles ; the recti, pyramidales, transversales, obliqui interni, and obliqui externi.

In some subjects, the pyramidales are wanting ; and as the obliqui externi are
those

those which in hernia are most connected with the disease, I shall here describe these only.

The *obliqui externi* are two thin, broad muscles : on their posterior and upper parts they are fleshy ; and tendinous on their anterior and lower parts. They originate from the eighth, ninth, and inferior ribs, by fleshy portions which intermix in a serrated manner with corresponding parts of the *latissimus dorsi*, *serratus major anticus*, *pectoralis major*, and *intercostales* : And afterwards becoming tendinous, they form the greatest part of all the anterior surface of the abdomen, and are inserted into the *linea alba*, the spine of the *os ilium*, and the *os pubis*. On each side of the under part of the abdomen immediately above the pubes, two openings are met with in these tendons, intended for the passage of the spermatic vessels in men, and for the ligaments of the womb in women. These openings, or rings as they are termed, which seem to be formed merely by a separation of the

fibres of the tendon from one another, are of an oval figure, and have an oblique direction from the spine of the ilium downwards; they are somewhat wider above than below, and are rather of a larger size in men than in women.

Although these rings or openings have been commonly described as passing through not only the external oblique, but the transversales and internal oblique muscles also; yet we now certainly know, that it is in the tendinous parts of the external oblique muscle only, that any such opening exists. It is of some importance to be thoroughly acquainted with this; for, by the accounts received of it from books, we are led to suppose, that, instead of one distinct passage, there are always three. These muscles are likewise perforated in the middle by the umbilicus, which affords a passage for the connecting vessels between the mother and uterine fetus, and which is so far continued through life, that the space is filled up with cellular substance only.

From

From the inferior border of the tendinous part of the external oblique muscle, a detachment of fibres is sent off, which, after affording a firm covering to the inguinal glands, are lost in the fascia lata of the thigh; and the under edge of this tendon being folded inwards, obtains the appearance of a ligament, which stretches from the fore-part of the os ilium to the pubes, forming a kind of arch, through which the great bloodvessels of the lower extremity pass to the thigh. It is this ligamentous-like portion of the external oblique muscle, that is known by the appellation of the ligament of Poupart or Fallopius.

This passage for the bloodvessels of the thigh, being larger in women than in men, owing to the greater size of the pelvis in the former, by which the arch formed by Poupart's ligament is rendered both longer and wider; so in women the crural hernia, or that variety of the disease formed by a protrusion of parts through this passage, is more frequent than in men.

The

The internal surface of the muscles of the abdomen, together with every other part of that cavity, is lined with a smooth somewhat elastic membrane, termed Peritonæum. This membrane, besides lining the cavity of the belly, furnishes the external covering to almost all the viscera contained in it ; but, in so singular a manner are these coverings produced, that although at first sight the different viscera appear all to be contained within the cavity of the peritonæum, yet on minute examination they are in reality found to lie behind it.

The peritonæum, after having completely lined the cavity of the abdomen, is continued or reflected over all the viscera, so as to give an external covering to each. After surrounding one of the viscera, it stretches along to the most contiguous, forming in its course the supporting membranous ligament of the liver, and other viscera ; and affording in its duplicature a kind of support or connection to the various bloodvessels, as they stretch along
to

to their destined situations in the intestinal canal and other organs.

Behind the peritonæum there is a quantity of loose cellular substance, by authors commonly termed its Appendix. In some parts this substance is filled with fat; and in others it is empty, and can easily be filled with air.

The testes in the fetus, till near the period of delivery are lodged in the cavity of the abdomen, in the same manner with the rest of the abdominal viscera. They are situated immediately below the kidneys, on the fore-part of the psoæ muscles, near to the upper end and by the side of the rectum, where their external covering adheres by its posterior surface to those parts of the peritonæum on which they rest, while all their anterior and lateral surfaces lie loose in the abdominal cavity in contact with the other viscera. Even in this situation, however, a connection takes place between the testes and scrotum. This is formed by means of a substance that runs down from the under

der end of the testis to the scrotum, forming a kind of pyramidal-shaped ligament; its large bulbous head being fixed to the lower end of the testis and epididymis; and its under extremity, after having passed through the ring in the external oblique muscle, being lost in the cellular membrane of the scrotum. This ligament is evidently vascular and fibrous, and seems in part to be composed of the cremaster muscle turned inwards *.

All that portion of the ligament contained within the parietes of the abdomen passes behind the peritonæum, and receives a covering from it in the same manner with the testes and other viscera: the peritonæum even gives a coat to a portion of the ligament after it has got into the groin, by passing down along with it from the abdomen into the upper part of the inguen.

At

* See a very accurate account of the Anatomy of these parts by Mr J. Hunter, in Dr Hunter's Medical Commentaries.

At this place, viz. at the annular opening of the external oblique muscle, the peritonæum is very loose; and when the ligament and scrotum are drawn downwards, an aperture is observed from the cavity of the abdomen all around the fore-part of the ligament, that seems ready to receive the testis; and this aperture gradually becomes larger as the testis descends behind the peritonæum in its way to the scrotum. While the testicle is ready to descend, it does not fall down, as has been commonly imagined, along the fore-part of the peritonæum, between it and the other viscera; but the ligament I have described, as lying behind the peritonæum, and connected with the testis at its under and posterior parts, by directing or pulling it down as it were, from behind, brings it in this manner along the psoas muscle between it and the peritonæum; and that part of this membrane to which I have shown that the testicle adheres, being necessarily drawn along with it, a kind of pouch or bag somewhat resembling

resembling the finger of a glove, is thus formed by this elongation of the peritonæum; the under extremity of which still continues to surround the testis as it goes along, in the same manner as it did while the testicle rested upon the psoas muscle; and the entrance from the abdomen to the cavity of this process, is exactly at that point where the testis was originally situated; for it is there that this process commences when the testis begins to descend.

The peritonæum being in a fetus remarkably lax and dilatable at this part, and being connected posteriorly, as we have seen, with a quantity of loose cellular substance, its elongation produced by the descent of the testicle is in this manner provided for by nature, and of course is easily admitted of.

It must not, however, be supposed, that the testis and peritonæum in coming down fall loosely and without connection; for, as they slide down very slowly, they still continue to adhere to the parts lying behind

hind them, as they did when in the abdomen.

The precise time at which the testis passes down from its original situation in the abdomen, cannot be ascertained; but in general, this change takes place about the eighth month. About this period, the testis, surrounded with the peritoneal process, moves downwards, till its under extremity comes in contact with the most inferior point of the abdominal parietes; and by this time the passage through the tendon of the external oblique muscle is found much enlarged, by the ligament of the testis having sunk downwards so as to dilate it.

After the testis has passed the tendon of the muscle, it commonly remains for some time by the side of the penis, and by degrees only descends to the bottom of the scrotum; and even when it has got entirely into the scrotum, its ligament is still connected with it, and lies immediately under it, but is shortened and compressed.

The

The process of the peritonæum, which appears to descend with the testicle, continues to cover it when it has reached the scrotum: It is this loose covering or bag, which is afterwards converted into what Anatomists term the *Tunica Vaginalis Testis*; and from the description which I have given of it, it is evident, that the cavity of this bag must at first communicate with the great peritoneal cavity of the abdomen. This it accordingly does, as a probe may be passed readily and easily along this process or bag, from the belly down to the bottom of the scrotum; and if laid open through its whole length on the fore-part, it will be plainly seen to be a continuation of the peritonæum; the testis and epididymis will be found at the lower part of it without their loose coat the *tunica vaginalis*; and as the spermatic vessels and vas deferens, while the testicle remained in the abdomen, entered the body of that gland behind, and between the reflected lamina of the peritonæum, so here, when in the scrotum, they will be found

found covered by the posterior part of the bag, in their whole course from the commencement of that process down the groin to the testicle.

This passage from the cavity of the abdomen to the scrotum is in general very soon cut off, by a firm adhesion taking place between the sides of the peritoneal process at its upper extremity where it descends from the abdomen. What the cause of this adhesion may be, is uncertain; perhaps it may proceed from some slight degree of inflammation being excited upon the contiguous parts by the forcible passage of the testis; but whatever the cause may be, the fact is, that at the time of birth this passage in general is completely obliterated*.

VOL. V.

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* The descent of the testes from the abdomen is a phenomenon very difficult to account for, and its immediate cause may probably always remain a mystery; but their being in almost every instance found in the scrotum before birth, is a clear proof of their not being forced down by the effects of respiration, as has been commonly supposed.

It is in the neck only, however, or in the superior part of this process, that this adhesion takes place: The lower extremity of the sac remains open and loose through life, and forms, as I have already observed, the tunica vaginalis testis, the common seat of a hydrocele.

If attention is given to this description, it must appear, that if immediately upon the testicle descending from the abdomen, and before the passage is sufficiently contracted, any portion of the alimentary canal or omentum should likewise fall into the opening, such parts must for certain lodge in the same bag or covering with the testis itself; and as long as they remain there, that they must effectually prevent the usual obliteration of the passage from being accomplished.

It is this occurrence, of a portion of some of the abdominal viscera getting into the tunica vaginalis testis, which forms that species of hernia to which new-born infants are liable, termed *Hernia Congenita*. The testicle and protruded intestine
being.

being here in contact, the tunica vaginalis testis forms the hernial sac.

If the gut, or other parts which have fallen down, are again pushed into the abdomen, and retained there by a truss, the passage soon fills up, and no return of hernia takes place. But if this is neglected, and the gut allowed to remain long down, the parts forming the passage seem thereby to lose that power of adhesion which naturally they are known to possess; instances being often met with where no art is able to produce this wished-for obliteration.

The hernia congenita is usually produced in the manner I have described: I believe, however, that it may happen, and I think I have seen instances of its doing so, from this passage between the abdomen and testicle, after having been once closed, being again rendered pervious, in consequence of the parts being over-stretched by those violent fits of coughing, crying, and other convulsive affections to which children soon after birth

are liable. The intestinal canal and other viscera, being pushed with violence against the containing parts, these will most easily give way that are the least firm, and this will most probably be the case with those that have been most recently united. In this manner, it is probable that a great proportion of those herniæ are produced which happen in early infancy; and I am inclined to think, that even in more advanced stages of life, the same variety of hernia may occur from the same cause.

It is evident, then, in what manner the hernia congenita is produced: We shall now inquire into the causes of hernia in its more usual form.

I. The containing parts of the abdomen are elastic and compressible; whatever, therefore, tends by compression or otherwise to lessen the cavity of the abdomen, must occasion a proportional risk, of some of the contained parts being pushed from their natural situations. The abdominal muscles and diaphragm are excited to severe contraction, by various causes,

causes, particularly by violent coughing, crying, laughing, and severe bodily exertion; and as the contraction of these muscles must always lessen the abdominal cavity, these causes therefore are frequently productive of hernia.

II. Falls, in consequence of the derangement which they produce in the abdominal viscera, from the sudden and violent shock with which they are often attended, are not unfrequently the immediate causes of hernia.

III. Persons of a preternatural laxity of frame, are very liable to hernia. The containing parts of the abdomen, from the want of sufficient tone and firmness, are unable in such people to resist the weight of the different viscera: They are therefore more particularly liable to hernia on the application of any of those causes that usually give rise to it.

IV. Sprains are apt to induce a laxity of the injured part; and have therefore a similar influence in inducing hernia, with general laxity.

V. It has been observed, in those countries where oil is much used as an article of food, that the people are particularly liable to herniæ. In confirmation of which I may remark, that all who have attended the hospitals in France, where much oil is used, and where hernia is one of the most prevailing diseases, are astonished to find that it is not frequent in the hospitals of London and Edinburgh: One foreigner in particular remarked to me, that in a single hospital in Paris, the operation for strangulated herniæ during his residence there had been performed upwards of a hundred times in one year, while in some of the largest hospitals of London, it was only performed twice during the same period, and in eight or nine months here he had only seen it once.

In whatever parts the parietes of the abdomen are weakest, these various causes will most readily operate in producing herniæ; and accordingly we find, that
descents

descents of the bowels usually occur only in such parts.

The parts which from anatomy we would à priori suspect to be most liable to herniæ, are, the openings already described in the external oblique muscles; the arch formed by Poupart's ligament for the passage of the great bloodvessels of the thigh; and the umbilicus, where the same firmness does not take place as in the rest of the tendinous expansion of the abdominal muscles.

These, as I have already observed, are the usual seats of hernia; but it sometimes happens, that parts of the viscera are protruded between the interstices of the different muscles of the abdomen: This, however, is not frequent.

In whatever part a descent of any portion of intestines occurs, except in hernia congenita, as all the viscera are contained in the manner already described, within the peritonæum, a portion of that membrane, it is evident, must be carried down along with the parts that are pro-

truded ; and in every such instance, it is this portion of the peritonæum going down along with the gut that is termed the Hernial Sac. The size and thickness of this sac is various in different subjects, and in different stages of the same disease.

On the first appearance of hernia, the sac is commonly small, for the protrusion seldom becomes large at once ; but by repeated descents of the bowels, the sac is pushed lower and lower, till in some instances its bulk is very considerable indeed ; and when in this advanced period of hernia the sac is laid open, it is found to contain either large quantities of omentum or intestine, and frequently large portions of both.

As the peritonæum has this property in common with other parts of the body, of thickening according to the degree of gradual extension applied to it, so the thickness and firmness of the hernial sac is often surprisingly great, a circumstance which

which every operator should keep in view.

Although every instance of any portion of intestine protruded from its natural situation, is to be considered as a derangement, and as such demands our attention, yet daily instances occur, both of recent herniæ, and of those of longer duration, from which no bad symptoms ensue. Thus we often meet with large hernial swellings, without the patient suffering in any other manner, than from the inconvenience arising from the bulk of the tumor. In general, however, it is otherwise; and troublesome symptoms most frequently take place; but whether they do or not, when the reduction of a hernia can be accomplished, it ought always to be done as quickly as possible.

All the bad symptoms arising from hernia, proceed either from obstruction to the passage of the feces when the intestinal canal forms the tumor, or from a stoppage of circulation occasioned by stricture on the prolapsed parts; so that the
danger

danger of the attending symptoms, it is evident, will always in a great measure depend on the nature and importance of the parts that are protruded.

Thus, when a portion of omentum alone forms the substance of a hernial swelling, as that organ is not so immediately necessary to life as many of the other viscera, it is not so frequently productive of danger, as when a part of the alimentary canal is either protruded by itself, or along with the omentum.

Although this, however, is in general the case; yet it sometimes happens, that even an omental rupture is attended with danger. When the stricture is so complete, as to put a stop to the circulation in the protruded part, mortification with all its bad consequences must ensue. And besides, the connection between the omentum, stomach, and other viscera, is such that a sudden descent of any considerable portion even of omentum, is apt to bring on vomiting, hickup, and other symptoms of distress. And, lastly, although a rupture

ture containing omentum only, might not of itself prove hazardous ; yet as the passage through which the omentum has slipped, must remain open as long as the protrusion continues, and as this must render it easy for a portion of gut likewise to get down, this of itself is a sufficient reason for bestowing even upon an omental hernia our most serious attention.

But whatever the contents of herniæ may be, whenever stricture occurs on them, sufficient to produce either a stoppage of the circulation, or of the fecal contents of the alimentary canal when a portion of gut forms the disease, the following in general are the symptoms that take place.

An elastic colourless swelling is observed at the part affected ; a slight pain is felt, not only in the tumor itself, but, if part of the alimentary canal is down, an universal uneasiness is perceived over the whole abdomen, and the pain is always rendered worse by coughing, sneezing, or any violent exertion. The patient complains

plaints of nausea; an inclination to retch; he can get no discharge by stool; he becomes hot and restless; and the pulse is commonly hard and quick.

If the swelling is entirely formed by a portion of gut, and if no feces are contained in it, it has a smooth, equal surface; and although easily compressible, it instantly returns to its former size on the pressure being removed. But, in gut ruptures of long duration, where hard feces have collected in the protruded bowels, firm inequalities very commonly take place.

When again the tumor is composed both of gut and omentum, its appearance is always unequal: It feels soft and somewhat like dough, nor is it so elastic as when part of the intestinal tube only is down; for although like the other it is compressible, it does not so readily regain its former dimensions on the pressure being taken off.

It has been a received opinion, that in strangulated hernia, the symptoms should be

be less violent when the intestine is accompanied with a portion of omentum, than when the gut alone is down. Little or no difference, however, occurs from this ; for when the gut becomes obstructed and inflamed, the symptoms which ensue are nearly the same whether the omentum is down or not.

It will readily, however, be supposed, that the symptoms described above, can never take place from the presence of omentum only ; for although stricture produced on a portion of omentum, even when no part of the intestinal tube is down, may excite much distress, such as pain, sickness, vomiting, and twitching pains through the whole belly ; yet no obstruction of the gut ever occurs from it, and of course none of the symptoms ever prove so alarming as when any part of the gut is concerned.

If the symptoms arising from a strangulated gut, are not soon obviated by the stricture being removed, the nausea and retching terminate in frequent vomitings,
first

first of a bilious, and afterwards of a more fetid matter; the belly becomes tense; the pain more violent; a distressful convulsive hickup takes place; the fever, which at first was of little importance, begins to increase; the patient is all along exceedingly restless, and continues in a disagreeable state of anxiety through the whole course of the disease.

These symptoms having for some time gone on with violence, the patient is apt at last to be suddenly relieved from pain, when he flatters himself that every risk is at an end: But instead of this, the pulse, from being hard and frequent, becomes languid and interrupted; cold sweats break out over the whole body, and especially on the extremities; the eyes become dull and languid; the tension of the abdomen subsides, and the tumor in part disappears; the skin covering the tumors, which before was either of a natural appearance, or red and inflamed, now becomes livid, and a windy crepitous feel is distinguished

distinguished in the substance of the tumor.

If the protruded parts have not of themselves gone entirely up, their return is now in general easily effected with gentle pressure, and the patient then discharges freely by stool; but the cold sweats increasing, the hickup turns more violent, and death itself is at last ushered in by its usual fore-runners, *subsultus tendinum*, and other convulsions.

These are the ordinary symptoms of what is termed a strangulated or incarcerated gut rupture; that is, when the parts protruded become so affected by stricture, as to produce pain; and do not either return to their natural situation on the patient getting into a horizontal posture, or cannot be replaced by the hands of a practitioner.

In whatever situation a strangulated hernia may occur, our only rational method of cure must consist in the removal of that stricture by which the return of the protruded parts is prevented. It is this
that

that we are to consider as the cause of the mischief; and unless it is completely removed, nothing effectual can be done for the relief of the patient.

Various methods have been proposed for the removal of these strictures; all of them, however, may be comprehended under two general heads.

I. Such as tend to the reduction of the protruded parts, without the interposition of any chirurgical operation usually so called; and,

II. A division of the parts producing the stricture, so as to admit of a replacement of the deranged viscera, constituting what in general is termed the Operation for the Hernia.

The remedies to be employed for the first of these, are, a proper posture of the patient, with the manual assistance of a practitioner; blood-letting; stimulating glysters; opiates; the warm bath; and proper applications to the tumor itself.

As soon as a practitioner is called, the first circumstance requiring his attention, is,

is, the posture of his patient, which ought to be such as will most readily favour the return of the protruded parts. Thus, when the tumor is in the groin, or in the fore-part of the thigh, the patient should be so placed, as to raise his thighs and legs considerably higher than his head and trunk; that is, he should be placed nearly perpendicularly upon his head.

This position causes almost the whole quantity of intestines to hang or swing by the protruded parts, and it frequently proves a means of reducing them: Placing the patient's feet over the shoulders of another person, while his body is allowed to hang downwards, and causing him in this posture to be jolted about, has in some instances answered when every other means have been tried in vain.

For the same reason that in the inguinal and femoral hernia this position is more advisable than any other, the usual erect posture of the body becomes most proper in cases of exomphalus or umbilical rupture; and again, a horizontal po-

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sture is most likely to prove useful in ventral hernia.

While the patient is thus placed in the most suitable posture, the surgeon should endeavour to assist the return of the protruded parts, by gentle pressure with his hands and fingers. In the inguinal or scrotal hernia, the pressure should be made obliquely upwards towards the os ileum, so as to correspond as nearly as possible with the opening in the external oblique muscle. In the femoral hernia, the pressure should be directly upwards; in the umbilical hernia, downwards and backwards; and in the ventral hernia, directly backwards.

In herniæ of any considerable size, pressure is most conveniently made, by grasping the swelling with one hand from the bottom upwards, while with the fingers of the other we endeavour to push forward the contents at the superior part of the tumor. Some surgeons, in pushing forward the intestine, employ the fingers of both hands at the upper part of the tumor; but
the

the same purpose is answered equally well with the index and middle finger of one hand, while the other is employed with advantage in pressing the under part of the tumor upwards so as to co-operate in this manner in the reduction. It is this operation which by authors is termed the *taxis*. No description, however, can convey an adequate idea of the manner in which it should be performed: for, like many other points in the art of surgery, a knowledge of it can only be obtained from experience and observation: But this must always be had in view, that any pressure we employ should be of the most gentle kind; for whatever creates much pain, proves prejudicial, and ought to be avoided.

In attempting to reduce the contents of herniæ, so much force is often employed, and in such a rough manner, as can scarcely fail to injure the protruded parts: Nor is the risk, that ensues from this, ever compensated by the practice proving more successful; for where a proper application

of gentle pressure does not answer, we never succeed with much force.

If moderate pressure, therefore, does not soon prove effectual, other means should be immediately advised. Blood-letting is here to be considered as a principal remedy; for in no disease does it afford more relief. The quantity to be taken must in a great measure depend on the strength of the patient: but if in any case we can with propriety venture upon abstracting large quantities of blood from weakly patients it is here; and we often perceive with surprise to what length it may be carried without hurting the system. A state of deliquium being known to produce more complete relaxation of all the muscular parts of the body, than can be obtained in any other way, it has sometimes been advised, in the treatment of hernia, to take off such large quantities of blood, and in such a sudden manner, as to excite fainting; and the practice has in some instances proved effectual.

As

As obstinate costiveness is commonly one of the most alarming symptoms of hernia, it has been the prevailing practice to prescribe not only stimulating purgatives by the mouth, but injections of the most acrid kind. In judging, however, from experience, I would say, that the practice should not be adopted; for when it does not prove useful, it very universally does harm, by increasing the sickness at stomach which always prevails here, while at the same time it adds to the pain and tension of the tumor. I am clearly, therefore, of opinion, that remedies of this class should not be pushed so far as is commonly done; and instead of purgatives by the mouth, I would recommend injections of tobacco-smoke. A variety of machines have been invented for injecting smoke by the anus; but none answer the purpose so well as the instruments represented in Plates LXIII. and LXIV. They are easily procured; and by means of either of them, smoke may be injected with any necessary force.

I would not have it supposed, however, that I recommend tobacco-smoke used in this manner as an infallible purgative, as many have done. For the contrary is certainly the case: I have known it used in various instances, both of hernia and ileus, and not often with advantage. I only advise it as the most effectual remedy of this class with which I am acquainted; and I know that this mode of injecting it, is the most effectual hitherto invented. It has been objected to the instruments I have delineated, that we cannot by means of them ascertain the quantity of smoke we inject. But this is a nicety of little importance; as the rule in all such cases should be, to continue to throw up the smoke, either till it has produced the wished-for effect; till a considerable degree of sickness is induced; or till the abdomen is found to be distended, for which in some patients much more is required than is found to answer in others.

But although this remedy does not frequently answer as a purgative, it proves often

ten useful as an anodyne both in hernia and ileus. And as we are often in such cases deprived of the advantage of opium, by the stomach not being able to retain it, we may occasionally, in severe degrees of pain, have recourse to glysters of tobacco-smoke, as one of the best means of procuring ease.

Among the list of purgatives employed in herniæ, acrid suppositories, composed of soap, aloes, and other stimulating materials, have been much recommended; and when remedies of this class are to be used, these may be considered as a necessary addition to the others; but no great dependence should ever be placed on them.

We are told, indeed, that in some cases of hernia, drastic purgatives have been of advantage; but I have so frequently known them do harm, by increasing the nausea, pain, and inflammation of the strangulated gut, that I am under no difficulty in saying that they ought never to be used.

Opiates prove often useful, not only by relieving pain, but as tending to relax those parts which, by being preternaturally constricted, we consider as the principal seat of the disease. I have already observed, however, that the retching which takes place in most cases of hernia, prevents the exhibition of opiates by the mouth ; but in such instances they may be applied with advantage in the form of injection, and their use may be alternated with injections of tobacco-smoke, as I have already pointed out.

Warm bathing is another remedy from which much advantage has been derived in the treatment of herniæ: Not the local application of heat, however, as conveyed in the form of poultices and fomentations, but the universal warm bath, in which the whole body is immersed, and which we know to be possessed of very relaxing powers.

Immersing the whole body in a warm bath, by tending to relax the constriction on the protruded intestines, may prove useful

ful by promoting their replacement ; but the local application of heat to the swelled parts, although commonly advised, is very apt to do harm. On the constricted tendon it can have no influence, for it lies so deep as to be little affected by remedies of this kind. And as the heat conveyed in this manner must tend to rarefy the contents of the tumors, and must thus increase the bulk, instead of answering any good purpose, on this principle it is evident they must do harm ; and accordingly, whoever will attentively observe their effects, will find that they do so. When the external teguments are much inflamed and painful, by their emollient properties, they may afford relief ; but the ease thus obtained proves only momentary, as the pain commonly soon becomes more severe than it was before.

Whoever attentively considers the nature of hernia, and the means that prove most effectual in the cure, must be of opinion, that all the bad symptoms that appear in it, arise from stricture produced
upon

upon the protruded parts. By some, however, a different opinion has been held forth, and all these symptoms have been imputed to spasm or inflammation in the protruded parts themselves, independent of stricture or any other affection of the parts through which they have passed.

That inflammation of the prolapsed bowels, in whatever way it may be induced, will, in general, terminate in all the symptoms of strangulated hernia, no person will doubt; but that stricture in the tendons, through which the bowels have passed, is the most frequent cause of this inflammation, is also obvious. Admitting, however, that the cause of all the bad symptoms in hernia should originate in the parts that have been protruded, and that they are not induced by the opening through which they have passed, being lessened by stricture, still the application of heat to this kind of tumor must be improper, as the rarefaction which it excites, by giving an increased bulk, must necessarily increase the danger.

While

While we might, *à priori*, be warrant-ed to argue in this manner, I can from practice and experience assert, that we derive more advantage from the external application of cold than I have ever perceived from any other remedy. In various instances I have applied ice and snow with much advantage, and I never saw them do harm*. But, in general, the remedies upon which I depend are, cold saturnine solutions, and cloths kept constantly moist with a mixture of cold water, vinegar and brandy.

By these remedies alone we sometimes succeed, without further assistance: But it frequently happens, notwithstanding every attempt, that the protruded parts cannot be returned; the symptoms, instead of abating, become more violent; and the event of the disease becomes of course more doubtful.

In .

* By some writers, this practice has been considered as hazardous; but I find it recommended by others to whom much credit is due, particularly by the late Dr Monro. See his works, 4to edition, p. 559.

In this situation, we should again endeavour to return the contents of the tumor, by a proper application of pressure with the hand, assisted with due attention to the posture of the patient; but where this does not soon prove successful, the division of the parts by which the stricture is produced should be advised as our only resource.

This, it may be remarked, is one of the most important points on which a surgeon has ever to decide: I mean the exact period at which the treatment of hernia, by means such as I have pointed out, should be laid aside, and the operation be put in practice. If a surgeon, without having given a full trial to all the usual remedies, should early proceed to the operation, and if unfortunately it should not succeed, he would probably be blamed by the friends of the patient as the principal cause of his death; and again, even allowing a recovery to be obtained by the operation, he is apt to be blamed, not only by his brethren of the profession, but

but by the patient himself, for having made him suffer an unnecessary degree of pain.

In such circumstances, a practitioner is very apt to feel himself embarrassed. But we ought here, as in every critical situation, to be entirely directed by experience; and if this rule was kept in view, instead of the usual delays in almost every instance of strangulated gut, we would advise the operation at a more early period.

The operation of the hernia is no doubt liable to some hazard; but the danger attending it has by many been magnified more than it ought to be; for, so far as I can judge from experience, the risk from the operation being long delayed, is infinitely greater than from the operation considered abstractedly.

Were we able, from the symptoms, to determine the exact period at which the operation should be performed, no kind of difficulty would occur from it; but this is so far from being the case, that the most experienced surgeons seldom agree on it.

In

In some instances, hernia, with every symptom of strangulation, continues for six, eight, or ten days; and after all, the protruded parts are replaced, and the patient does well: and in many similar cases when the operation has afterwards been found necessary, although the severest symptoms may have subsisted for several days, yet, on laying the parts open, no appearances either of inflammation or gangrene have been discovered.

With others, again, the same set of symptoms, with perhaps no more tension in the tumor, prove quickly fatal. In some of these, the rapid progress of the disease is often astonishing; the space of forty-eight hours hardly intervening, from the first attack till the death of the patient: I have even known the intestines become perfectly gangrenous in the course of one day from the time of their first expulsion.

Every practitioner of experience knows, that this is the state of the question; and if so, it must at once be obvious, that long
delays

delays must in such critical circumstances be always hazardous ; and as the danger from the operation itself, is trifling when compared with the risk accruing from delays, it ought, I think, to be an established maxim, to proceed in every instance to the operation, if in the space of a short time blood-letting and the other remedies that I have mentioned, or which happen to be used, do not prove effectual. Two or three hours at farthest, even when practitioners are early called in, is, perhaps, the greatest length of time that should be consumed in trials of this kind.

In the treatment of herniæ, it has been remarked, that the French surgeons prove usually more successful than German or British practitioners ; and so far as I know, no reason can be assigned for the difference, but that the French proceed more early to the operation than the surgeons of almost any other nation. They will thereby, no doubt, perform it on some patients who might have recovered by more gentle means ; but any inconvenience

nience arising from this to a few, is fully compensated by the number of lives that must be saved by having recourse to it in due time, which otherwise might probably have been lost.

Although for obvious reasons the reduction of the contents of *herniæ* should in every instance be attempted, yet cases often occur in which it cannot be accomplished.

When the reduction has once been completed, we have it in our power to prevent the disease from returning, by the constant application of a proper truss to the opening at which the parts were pushed out. But, from this being neglected, ruptures which might at first have been easily cured, come at last by repeated descents, and by the great quantity of parts that fall down, to form tumors of such magnitude, in proportion to the opening through which they were forced, that no art can replace them by the more simple means of reduction.

But

But besides this, such adhesions frequently take place, between the viscera forming the swelling and the surrounding parts, as render it impossible to return them by any other means than the operation. By this, indeed, perhaps every case of hernia may be reduced; but, however necessary this operation may be when a patient is in danger, as it is always attended with some hazard, it should seldom be advised where symptoms of strangulation do not actually exist.

In that indolent or chronic state of hernia we have just been describing, although by interested and ignorant practitioners the operation has been often proposed as a radical cure, yet surgeons of character would in such circumstances seldom advise it: They would rest satisfied with preventing any accumulation of feces in the intestines, by prescribing a proper diet, and the occasional use of gentle laxatives; and with obviating, by a suspensory bandage, any inconvenience that

might arise from the weight of the tumor.

By these means alone, even the largest herniæ are often made easy and supportable for a great length of time ; the circulation of the parts contained in the swelling goes freely on, as well as the peristaltic motion of such parts of the alimentary canal as are protruded ; and hence it is, that we have many instances of large portions of the gut falling down even to the bottom of the scrotum, and continuing there for a great number of years, without giving any interruption to the usual discharge by stool.

In this state of the disease, therefore, the operation can seldom be admissible. But although people with hernia in this situation frequently enjoy good health, and sometimes feel little inconvenience from the tumor, yet it must not be supposed that their situation is free of danger : On the contrary, we often observe, that the disease, after subsisting in this state for a great length of time, will inflame and
become

become painful, so as to excite every bad symptom commonly induced by real strangulation of a gut. As long, too, as the tumor continues, as the opening through which the parts have been pushed is thereby prevented from closing, so the patient still remains liable to descents of other portions of intestine which have not formerly been down, and by which the most fatal symptoms may be induced. But what I here wish to establish is, that, till once these bad symptoms actually occur, either from an affection of that part of the gut which has been long down, or of a portion more recently protruded, the operation for the hernia ought seldom to be advised. All that can here be done with propriety is, to fit the patients with proper suspensory bandages; to warn them of the risk they will incur from laying them aside; and to caution them against violent exercise, particularly leaping, and every sudden exertion.

Although with practitioners of reputation this circumstance cannot require

much discussion, yet the public at large are much concerned in it. The former know, that the operation should be seldom performed in any case of hernia where violent symptoms do not actually exist; but the latter, not being able to judge of the various circumstances to be taken into consideration, are too frequently imposed on by that numerous set of itinerants with which every country abounds. By these a variety of operations are put in practice for performing what they call a radical cure of ruptures; by which they mean to say, a prevention of future descents.

But as no remedy with which we are acquainted, a well-adapted truss only excepted, can be depended on for this purpose; and as all the other means that have been advised for it, are not only painful, but highly dangerous, the magistracy of every community ought to interfere in suppressing them.

The object in view by all these attempts, is, either to destroy the hernial sac entirely,
or

or to procure an accretion of its fides; which, by those who are ignorant of the anatomy of the parts concerned, has been considered as sufficient to prevent any return of the disease.

In order to effect a total destruction of the sac, our forefathers employed not only the knife, but the potential and even the actual cauteries; and with a view to produce a firm union of its fides, which was considered as equally effectual, it was afterwards proposed by practitioners of more tender feelings, to employ the needle, and ligature, or what was termed the Royal Stitch: and for the same purpose was invented the famous *punctum aureum*, which was performed in the following manner. After reducing the intestines into the abdomen, the sac was laid bare with a scalpel; and a piece of gold wire being passed round the upper end of it, the wire being likewise made to include the spermatic cord, it was then ordered to be twisted with forceps to such a degree of tightness as to prevent the de-

scient of the gut, but not to interrupt the circulation in the spermatic cord *.

But none of these methods being found to answer, for even the actual cautery, although carried to the depth of the bone itself, does not secure the patient against a return of the disease, our modern pretenders have therefore ventured to improve upon the ignorance of ancient practitioners, and actually go the length of destroying, not only the hernial sac, but the testis also: without any knowledge of the anatomy of the parts, and having no reputation that can suffer by any consequences that ensue, they proceed without fear; and, by promising all that patients can hope for, they are sure to be well received. In consequence of this, in every large town, many operations are performed by them; numbers are accordingly mutilated, and many thereby even lose

* For a more particular account of these various modes of practice in hernia as employed in former times, see the writings of Albucasis, Paulus Ægineta, Fab. ab Aquapendente, Hildanus, and Ambrose Parey.

lose their lives. Their method of operating is shortly this: They lay bare the hernial sac, and having reduced the prolapsed parts, a strong ligature is passed round both the sac and spermatic cord, and drawn so tight as to destroy, not only the passage along the sac, but the cord itself, and of course the testicle. In some instances nothing further happens; but in others, such a degree of inflammation is induced, as to terminate in the death of the patient.

If any of these means, however, were to produce the wished-for effect, the prevention of future descents, the risk would in some measure be compensated by the advantage: But the fact is much otherwise; for unless a truss is kept constantly applied, the patient continues liable to a return of the disease in nearly the same degree as if no operation had been performed. Even the operation for the hernia itself, does not, as has been supposed, fortify the parts against a return of the disease, the continued use of a truss be-

ing nearly as necessary after that operation as if it had not been performed.

In a few cases, the opening may be so completely closed by the inflammation induced by the operation, that no farther descents would take place; but as I have known different instances of its failure, in which, from neglecting to wear a truss, the disease returned with the same symptoms of strangulation as before, I can without hesitation say that the principle should be adopted.

In Plate LXV. trusses are represented for different varieties of hernia. They are intended for the more usual forms of the disease, the inguinal, crural, and umbilical rupture. When others are wanted for particular parts, tradesmen in this line of business should be applied to, with directions to fit the instruments with the nicest exactness to the parts for which they are intended. Indeed, the advantages to be obtained from a truss, depend entirely on the exactness with which it is fitted; and nothing but the nicest attention

tion can prevent it from doing more harm than good. The sole purpose of a truss is to prevent the parts newly replaced from falling down. If therefore the pad or bolster with which it is furnished does not bear properly against the opening upon which it is placed, a portion of gut may slip out, and be materially injured by the pressure of the pad. I have met with different instances of this, where bandages by not being exactly fitted did much harm, and every practitioner must have observed them: it is therefore a matter of the first importance, that tradesmen be made to pay the most exact attention to this. All rupture-bandages should be of the steel spring kind; for those formed of linen and other soft materials, can never be kept properly applied. Even in infancy the steel truss may be made so light and easy as to be used with safety.

Having premised these general observations, which relate equally to every variety of hernia, I shall now proceed to consider more particularly the different forms of the disease.

SECTION II.

Of the Bubonocèle.

CONJOINED with the general symptoms of hernia enumerated in the last section, the particular appearances of the bubonocèle, or inguinal hernia, are, a soft somewhat elastic tumor, beginning in the groin, and descending by degrees into the scrotum in men, and labia pudendi in women. When a portion of gut forms the disease, the tumor is commonly tense in proportion to the degree of stricture in the opening of the tendon; and when the parts inflame, handling or pressure always gives pain.

When it contains omentum only, the tumor is both more soft, compressible, and more unequal, than when gut alone is down; the scrotum becomes more oblong
than

than in an intestinal hernia ; and when the quantity of omentum is large, it is also much more weighty than a gut rupture of the same size : But in a great proportion of cases, the tumor is composed both of gut and omentum : In this case the distinguishing symptoms of each can never be so clearly marked. Various symptoms indeed are enumerated by authors for distinguishing the contents of *herniæ* ; but whenever the case is complicated, every candid practitioner will admit, that no certainty can be obtained of this till the tumor is laid open.

As these parts are liable to other tumors with which the inguinal and scrotal hernia may be confounded, practitioners should be as much as possible acquainted with the marks of distinction. These tumors are, glandular or other swellings in the groin, whether from the venereal disease or any other cause ; that swelling of the testis termed *Hernia Humoralis* ; and the different varieties of hydrocele.

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The venereal bubo and other glandular tumors in the groin, are distinguished from hernia, not only by their wanting all the general symptoms of hernia, but by that incompressible hardness with which glandular swellings are at first attended, and by the fluctuation of matter which in their suppurated state is observable.

In the hernia humoralis, the hardened and enlarged state of the testicle; its being exquisitely painful to the touch; remarkably heavy in proportion to its bulk; and the spermatic process being commonly free from swelling; may be considered as certain marks of distinction. In the hernia humoralis, too, the intestines are free and unobstructed, and the other general symptoms of hernia are wanting.

In the hydrocele of the tunica vaginalis testis, the tumor in general is more equal than in hernia: In the former, it begins in the under part of the scrotum, and proceeds upwards; whereas the reverse occurs in hernia. In hydrocele the spermatic cord is in most instances distinctly

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ly felt, whereas in hernia where the tumor descends to the scrotum, the spermatic cord cannot in any part of its course be distinguished. In hydrocele, the fluctuation of a fluid is distinguishable; in hernia it is not.

From the anasarfous swelling of the scrotum, or hydrocele of the dartos as it is termed, hernia is easily distinguished; and indeed the means of distinction are so obvious, that they need not be enumerated; but there is another variety of hydrocele, the hydrocele of the spermatic cord, which in some instances it is difficult to distinguish from hernia, and which therefore requires particular attention.

Where the water is collected in one or more cells of the spermatic process, and begins in the under part of the cord, and proceeds upwards, this alone serves as sufficient means of distinction between it and hernia, in which the swelling must always proceed from above downwards; but it sometimes happens, that the water
begins

begins to collect even within the opening of the abdominal muscle, and by degrees falls downwards. In this case we cannot determine from the state of the tumor alone, whether it is the one disease or the other. The general symptoms of hernia, such as pain and tension of the abdomen, vomiting, and obstructed intestines, must be kept in view; for not being connected with hydrocele, they serve to ascertain the nature of the case, in which their absence might long remain doubtful. In some cases, however, these and every other means of distinction are wanting; but even in such circumstances a practitioner of experience will never incur the risk either of hurting his patient, or his own reputation, which the mistaking a Hernia for a Hydrocele, and treating it as such, must always do, and which, to the disgrace of surgery, has in some instances been done.

In all such cases of doubt, as well as in every tumor of the testicle where the most perfect certainty is not obtained, and in
which

which an operation becomes necessary, the surgeon should proceed as he would do in hernia : By doing so, every risk will be avoided : On the tumor being laid open, the true nature of the disease will become evident, and the practitioner will be at liberty to apply the means best suited for the cure. Whereas in proceeding differently as in some cases has been done, and treating as a hydrocele what afterwards proves to be hernia, he not only incurs the risk of injuring his own reputation, but of destroying his patient.

In the treatment of the Bubonocoele, when the means pointed out in the last section as applicable to every state of hernia do not succeed, we are then under the necessity of proceeding to the operation ; and the method of doing it is this :

A table of a convenient height being fixed in a proper light, the patient must be placed upon it with his head and body almost horizontal, whilst his buttocks are raised with pillows beneath them. The legs hanging over the edge of the table
must

must be separated so as to admit the operator between them ; and should in this situation be firmly secured by an assistant on each side, who should take care at the same time to keep the thighs so far raised as to relax the abdominal muscles.

That we may obtain as much empty space as possible for returning the protruded parts, the patient should be advised to empty his bladder ; and the parts having been previously shaved, an incision must now be made with a scalpel through the skin and part of the cellular substance, beginning an inch above the superior end of the tumor, and proceeding down to the most depending part of the scrotum. Even where the tumor does not reach to the bottom of the scrotum, the parts should be laid open in this manner. By a free external incision, we are enabled to finish the operation with more ease than when the first opening is small : it does not give much more pain ; and being continued to the bottom of the scrotum, the matter in the upper part of the sore is prevented from

from collecting below, which otherwise it is ready to do.

The operator must now proceed to divide the rest of the cellular substance covering the sac; and even this should be done with caution: For although in a great proportion of cases, the spermatic vessels lie behind the protruded parts, yet occasionally they are found on the anterior part of the tumor; so that in order to avoid the risk of wounding them, as soon as the skin is divided, the remainder of the operation should be conducted with much attention, care being taken to avoid every large bloodvessel that makes its appearance.

This circumstance of the prolapsed parts getting down behind the spermatic vessels, has never, so far as I know, been mentioned by authors: It must therefore be a rare occurrence. As I met with it, however, in one case, where the fact was obvious, the possibility of its happening I have no reason to doubt. If we attend only to the usual conformation of these

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parts, the hernial sac, we would say, ought never to get behind the spermatic cord : But we know well, that in no part of the human body is nature more apt to desert her ordinary course, than in some circumstances relating to the testes and their bloodvessels. I have already observed, that till near the period of delivery, the testicles continue in the abdomen ; and about this time, that they fall down in a gradual manner to the scrotum. Many instances, however, occur, of both testes remaining in the abdomen through life ; while sometimes one remains, and the other falls into the scrotum. In others, one or both fall into the groin, and never proceed farther ; a circumstance which young practitioners should be aware of, as instances have occurred of a testicle resting in the groin being mistaken for a hernia, and of much pain being excited by attempts made for reducing them. Now, if we frequently meet with such varieties as this in the mechanism of these parts, why may not nature sometimes produce

duce such a conformation as, on a hernial sac falling into the scrotum, may place it behind both the spermatic cord and the testicle? And as I have shewn that it has happened, and as it may therefore occur again, I consider it as a farther argument for the propriety of dividing the parts in the cautious manner I have mentioned *.

It is usual, in making the first incision, to pinch up the teguments, and then to divide them with a scalpel; but no surgeon of steadiness and dexterity will ever proceed in this manner. This incision of the skin is done with much more neatness, and with equal safety, by the operator grasping the tumor with his left-hand, in such a manner as to render the teguments on the anterior part of it tense, while, with the scalpel in his right-hand, he divides the skin from one end to the other.

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* Since this went to the press, I find that an instance is recorded by Le Dran, in his *Treatise of Ruptures*, of the spermatic vessels having been found on the anterior part of a bubonocoele.—This situation, therefore, of these vessels, is perhaps more frequent than is commonly imagined.

The sac being laid bare, an opening must be made in it, so as to bring its contents into view; and the most safe place for this being formed, is, not about the middle of the tumor, as is commonly directed, but as near to the under point of it as possible: It is here done with the same ease as in any other part; and besides, the gut is seldom found just at the bottom of the sac, which is commonly occupied with a quantity of bloody serum; so that the risk of wounding it in this situation, is less than in any other part of the tumor. In making this perforation of the sac, consists the greatest nicety in the operation, the utmost caution being necessary to avoid the parts which it contains. Good eyes and a steady hand are in no operation more requisite than in this: With these, any practitioner acquainted with the anatomy of the parts, will do the operation properly, and without them the best anatomist must go wrong.

With the same scalpel that divided the skin and cellular substance, the operator
must

must proceed slowly, dividing one fibre of the sac after another, till an opening is formed in it; which may be always discovered with the blunt end of a probe: If the probe passes in easily, we may conclude with certainty that the sac is divided; and if it does not, the incision must be continued in the same gradual manner somewhat deeper, when the same trial with the probe must be repeated.

In prosecuting this division of the sac, we derive much advantage from the use of a small sharp-pointed directory, open at the extremity, as is represented in Plate LXV. fig. 6. By pushing the end of it below some of the fibres of the sac, they are easily separated from the parts beneath, and may thus be divided with safety; and in the same manner the rest of the sac must be divided, till this part of the operation is completed*.

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* In the 4th Volume of Memoirs of the Paris Academy of Surgery, there is a paper on *Herniæ*, by Monsieur Louis. But although it contains many useful observations,

In almost every hernia in the groin, and even where the tumor extends to the scrotum, if the parts are recently protruded, the hernial sac is thin, and therefore easily cut through; but it is necessary for the information of young practitioners, to observe, that when hernia is of long duration, the sac frequently becomes so thick, as to require much more dissection than beginners commonly expect: By going on, however with the caution I have directed,

ventions, Mr Louis in one point I think has gone far wrong, in ridiculing that degree of caution which in dividing the hernial sac is unquestionably requisite: The division of the sac, he says, is attended with so little difficulty, that he does not consider it as different in that respect from the first external incision of the skin. His words are: “*J’a-*
“ *mais le sac ne m’a donné ni plus de peine, ni plus*
“ *d’embarras que la peau; on divise, pour ainsi dire, celle-*
“ *ci du premier trait, et le sac du second.*” In the hands of a very expert operator, the scalpel, even in this manner, may be so managed as to do no harm; but, in common practice, much mischief would be done by proceeding as Mr Louis has directed. It might tend to show the dexterity of an operator, but this would always be at the hazard of the patient.

directed, every risk of wounding any part of importance may be avoided.

As soon as an opening is made through the sac, a circumstance of which we become certain, as I remarked above, by a probe passing easily in, it ought then to be farther enlarged, by cutting upon the director, till it is of such a size as to admit the fore-finger of the operator.

The fore-finger of the left-hand must now be introduced, and used as a director for entering the narrow blunt-pointed bistoury, represented in Plate LXIV. fig. 3. with which the hernial sac must be divided along its whole length up to the opening in the external oblique muscle. With the finger used as a director for the bistoury, this part of the operation is performed with safety ; and the bistoury here delineated, renders all the instruments formerly employed not only for this part of the operation, but for the subsequent division of the tendon, quite unnecessary.

On laying the sac open at the bottom, a quantity of coloured fluid commonly

rushes out, and the protruded parts come fully in view : If a portion of gut is down, and not much entangled with omentum, by being now set at liberty, more of it comes instantly on the sac being opened ; thereby giving the appearance of having been collected in a larger quantity than the size of the tumor gave reason to expect.

The portion of gut that we meet with in hernial swellings is various, no part of the intestinal canal being entirely exempted from falling down. Hitherto the ileum has been commonly supposed to form the substance of a great proportion of *herniæ*, but later and more accurate observation renders it probable that the *cæcum*, appendix vermiformis, and part of the colon, are perhaps as frequently contained in *herniæ* as any other portion of gut.

The sac being laid fully open, the parts contained in it should be examined with the nicest attention, in order to discover whether they are sound or not ; and if upon attentive inspection they appear to be
found,

found, that is, if they are not evidently in a state of gangrene, even although they seem to be inflamed, they should be immediately returned into the abdomen.

Whether intestine or omentum, or a portion of each, have been contained in the tumor, those parts of them which have come last down should be first pushed back, the difficulty and trouble of returning them being thereby much lessened : And in making the reduction, it both answers the purpose better, and is less likely to do harm, to apply the fingers to that part of the intestine connected with the mesentery than to the convex part of it. While the reduction is going on, the patient's thighs and loins should be still more elevated than they were during the preceding steps of the operation ; for this posture of these parts tends much to facilitate the return of the protruded intestines to the abdomen.

When the disease is recent, and the parts have not been frequently down, it sometimes happens, that by pulling out a little
more

more of the gut, the difficulty that occurred to the reduction is thereby removed; and if the protruded parts are not of great magnitude, they may thus be sometimes reduced, without the opening being enlarged by which they passed from the abdomen: But when this cannot be done with ease, it should never be attempted; more danger being to be dreaded from force applied to the gut, than can ever occur from finishing the operation by enlarging the opening in the tendon of the external oblique muscle.

As the tendon of this muscle runs in an oblique direction from above downwards, and as the opening through which the contents of a hernia protrude, is formed by a separation of the tendinous fibres of the muscle from each other, the direction of this opening is of course the same with that of the tendon; that is, it runs somewhat obliquely from the spine of the ileum to the os pubis.

In enlarging this passage, then, for the reduction of the parts that have passed through

through it, as a transverse section of the tendon is not necessary, the knife should be carried obliquely upwards, so as merely to continue the natural separation of the tendinous fibres.

The finger was recommended as the best director for the knife in opening the sac, and in dividing the tendon it proves equally useful. By insinuating the finger into the aperture of the tendon immediately above the protruded parts, the point of the blunt bistoury, Plate LXIV. fig. 3. is easily introduced upon it; and in this manner, by keeping the end of the finger a little before the bistoury, the opening may be enlarged to any necessary extent without risk of wounding the contiguous parts.

In general, a very small enlargement of the natural opening in the tendon proves sufficient: But the size of the opening should be fully equal to the object in view; for it is better to make it somewhat too large, than to run any risk of hurting the gut by forcing it through a small aperture.

If

If on the introduction of the finger any adhesions of the gut to the contiguous parts are discovered, the incision in the tendon should be made larger than might otherwise be necessary, that the finger may be so freely admitted, as to destroy such adhesions as it can reach ; for if not removed, the operation would very probably fail.

Besides these internal adhesions, it sometimes happens, by long confinement in the scrotum ; pressure ; and perhaps from other causes ; that strong adhesions are formed among the parts contained in the sac : and before reducing them, it is always right to attempt to separate them.

When these adhesions occur, as they sometimes do, between different parts of the gut, they should be separated with much care ; but connections of this kind between one portion of gut and another, are seldom firm, and are commonly easily separated : when formed by means of long filaments, which is sometimes the case, the easiest method of removing them is to cut them, either with scissars or a bistoury ;

bistoury; but when one part of the gut adheres so firmly to another as not to be separated but with difficulty, it is much better to return the whole even in this state to the abdomen, than to run the risk of hurting it by employing much force.

When, again, adhesions form between the gut and the hernial sac, or between the gut and omentum, if the filaments by which they are produced cannot be otherwise removed, as there is no great hazard in wounding the omentum, and still less from hurting the sac, a small portion of both may be dissected off, and returned with the gut to the abdomen; and in like manner, when the omentum adheres so firmly to the sac as not to be separated in any other manner, no danger can accrue from the sac being encroached on.

The risk attending this practice is trifling, when compared with the inconveniencies that would ensue from leaving either the omentum or gut adhering externally to the hernial sac, as is advised by some when these adhesions cannot be easily

easily divided. The least portion of gut being left down, would run much risk of being injured by exposure at the different dressings; and by leaving part of the omentum to protrude through the opening from the abdomen, one advantage to be expected from the operation would be lost, namely, the prevention in future of that risk to which a patient with a portion of protruded omentum must be always liable, of a piece of gut slipping down, and perhaps of becoming strangulated.

After returning the contents of the sac into the abdomen, it has been proposed by some, to pass a ligature round the upper part of the sac just at its neck, with a view, as we are told, of procuring a reunion of its sides, in order that it may serve as a means of preventing future descents of the bowels.

But as a ligature cannot be applied in this manner without risk of injuring, or even of destroying the spermatic vessels, with which the posterior part of the sac is immediately connected, the practice, from
this

this consideration alone, should be laid aside ; but in reality it does not appear to be necessary, as this very union of the sides of the sac is always produced merely by that degree of inflammation which succeeds to the operation.

Hitherto I have advised the contents of herniæ to be immediately reduced, on the supposition that they have been only displaced ; that they have been adhering to each other or to the neighbouring parts ; or perhaps that they have been more or less in a state of inflammation. But when it appears that this inflammation has already ended in gangrene, as the return of mortified parts, whether omentum or intestine, might be attended with hazard, more caution is required.

When the omentum is found in a state of mortification, as a portion of it may be removed without much risk, it has been the common practice to cut off the diseased parts ; and in order to obviate any inconvenience from the hemorrhagy that might ensue, we are advised to make a ligature

gature on the sound parts previous to the removal of those that are mortified ; while, by leaving the ends of the ligature hanging out of the wound, the surgeon has it in his power to remove it whenever he may think fit.

Ligatures on the omentum, however, having frequently induced bad symptoms, such as nausea, vomiting, cough, fever, pains in the belly, and inability to sit erect ; and as we now from experience know, that no hemorrhagy of importance ever occurs from its being divided, such parts as have become gangrenous may therefore be freely cut off, and the remaining sound parts be introduced into the abdomen, without ligatures being put upon them. Of this I am convinced from experience, and it is also the opinion of others* : But if it should ever happen, on cutting

* A very accurate paper upon this subject may be seen in the third volume of *Mémoires de l'Académie Royale de Chirurgie* of Paris, by Monsieur Pipelet, in which several cases are related of the bad effects produced by ligatures on the omentum.

Mr Pott is also of this opinion.—Vide *Treatise on Ruptures*.

cutting off part of the omentum, that a vessel of any size is divided, a ligature may with safety be passed upon it with the tenaculum, without including any part of the membrane; and the ends of it being left to hang out at the wound, it may afterwards be pulled away at pleasure.

Another circumstance sometimes occurs, that renders the removal of part of the omentum necessary: When a hernia has been of long duration, and a portion of omentum has been long down, from the pressure made by the usual suspensory bandage, the protruded parts are apt to become thickened, hard, and collected into lumps. When these lumps are not large, they need not be removed, and when small, they may be returned into the abdomen without hazard; but whenever it appears, that by their bulk and hardness they might do mischief if forced into the belly, they ought certainly to be cut off.

When we determine to remove any part of the omentum, the easiest and safest method of doing it is this. The membrane

should be carefully expanded at the part intended to be cut, in which state it is easily divided with thin-edged scissars, more so indeed than with any other instrument. When fully spread out, any turn of the intestine that may be enveloped in it, is at once brought to view, which, without this precaution, we would run the risk of dividing with the scissars.

When, again, a portion of gut is found to be mortified, if returned in this state, a discharge of feces would certainly take place into the cavity of the abdomen, as soon as the mortified spot should separate from the sound. For the prevention of this, which would soon terminate in the death of the patient, if a small spot only is diseased, we should endeavour, with a needle and ligature, to connect the sound part of the gut immediately above the mortified spot, to the wound in the abdominal muscles. By this the feces are discharged by the wound, when the mortified spot either separates or is cut out; and different instances have occurred, where

where the loss of substance produced by the mortification was not extensive, of the opening into the gut becoming gradually less, and at last healing entirely: But whether the event should prove so fortunate or not, whenever a portion of gut is completely mortified, it should be secured with a ligature to the contiguous parts.

And farther, when the mortification is extensive, and includes, so far as it goes, the whole circumference of the gut, the gangrenous parts should be cut out at once; and if the quantity thus taken away is not so considerable as to prevent the ends of the gut from being brought into contact, it should be done immediately in the manner pointed out in Chapter III. Sect. XII. when treating of wounds of the Intestinal Canal: This at least affords a chance of the ends of the gut being made to reunite; and if this unluckily should not happen, a passage for the feces will still be secured by the groin.

Although in this manner many have recovered who otherwise must have died ; yet it must be admitted, that the risk of patients in this situation is very considerable : But although a small proportion only should recover, still practitioners would be to blame were they to omit those means which afford the best chance to their patients. A patient of my own is now living, and in good health, voiding his feces by the anus, who lost at least one foot of the intestinal canal by mortification in a case of crural hernia ; and we are told by different authors, of similar recoveries equally remarkable.

It is to the moderns chiefly, I may remark, that we owe this important improvement in the treatment of hernia. It is even recorded of Rau, who lived in a very late period, that on opening a hernial sac, where a gangrenous state of the parts was discovered, as the case was supposed to be desperate, he laid down his knife, and proceeded no farther in the operation. The patient, who died next day, would, in
modern

modern practice, have had at least some chance for life.

When it is therefore discovered, that mortification has taken place, all the diseased parts should be cut off, and the remaining sound part of the gut being retained with the fingers till properly secured with a ligature, the opening in the external oblique muscle may then be dilated with safety: Whereas, if it should be enlarged before the diseased part of the gut is taken away, the gangrenous portion might slip up together with the sound; but by this precaution, every risk of this kind is avoided.

The parts forming a hernia being all completely replaced, when the sac in which they were contained is found to be hard, enlarged, and much thickened, as no advantage could be derived from preserving it, such parts of it as can be cut away with safety should be removed: All the lateral and fore-parts of the sac may be safely cut off; but being commonly firmly connected with the spermatic vessels

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behind,

behind, this part of it ought not to be touched.

In common practice, the parts are now dressed with soft lint, and a suspensory bag employed for retaining it. But it answers better to draw the sides of the cut previously together, including the skin, cellular substance, and anterior part of the hernial sac, with a proper number of sutures, by which the cure is much more quickly accomplished, at the same time that the parts are rendered more firm than they otherwise would be: At one time, this practice appeared to me to be hazardous; and I advised it not to be adopted, as in two instances a portion of gut got down between the sutures, and one of the patients died before it was perceived: Farther experience, however, has made it obvious, that this may be always prevented, and that in various ways it proves useful: When the sutures are not above half an inch from each other, and made to pass to the bottom of the fore, so as to include all the anterior part of the sac, this

this accident can never happen. With a view to give a free vent to any matter that may form in the course of the cut, I have, in some instances, left an opening at the under part of it, but this precaution I now believe to be unnecessary: The futures being completed, the parts should be all covered with a pledget of any emollient ointment, together with some plies of soft lint, and the whole retained by the T bandage.

The patient must now be carried to bed; and being so placed as to have his loins somewhat elevated above the rest of his body, he should in this situation be laid to rest: Opiates are here particularly useful: To prevent, or at least to moderate, the fever which commonly succeeds, the patient should be kept cool: In plethoric habits, blood-letting should be prescribed, together with a rigid low diet; and, lastly, if the belly is not naturally open, a frequent use of gentle laxatives is particularly proper.

When, however, the strength has been previously much reduced, either by long sickness or any other cause, instead of blood-letting and a low diet, a nourishing regimen becomes necessary; for if a patient in such circumstances is not properly supported, he will not so readily recover: It is also proper to remark, that, in common practice, the indiscriminate use of blood-letting, and an abstemious regimen, in every case of hernia, appears to be too rigidly adhered to; for, although it proves always useful in hernia, attended with inflammation, yet daily experience makes it obvious, that it proves hurtful where the system has been already much reduced by evacuations, and where no inflammatory symptoms take place.

The sore should be looked at and dressed daily, by which means any change that may take place in it will be quickly discovered: The ligatures in the course of six or seven days should be withdrawn, and as soon as the parts are firmly cicatrized, a well-adapted truss should be applied

plied to them, and never afterwards laid aside: Some indeed assert, that a truss after this operation is unnecessary, and where the cure has been accomplished with ligatures deeply placed, in the manner I have pointed out, it might in some instances be so complete, particularly during youth, as to prevent all future descents; but as the contrary has, in various instances, happened, the patient should be always put on his guard against it.

In performing this operation, it was proposed a considerable time ago by Mr Petit of Paris, and other French practitioners, to reduce the protruded parts, without dividing the sac: Since that period, the practice has been adopted by others. Dr Monro thinks favourably of it, and on his suggestion I have, in different cases, performed the operation in this manner. But, however unwilling I am to differ from such authority, I cannot in this instance avoid it: The chief reason assigned for not opening the sac, is, that we thereby prevent the air from finding access

access to the intestines ; but although this would be highly desirable, if the operation could otherwise be equally well performed, as it does not appear to me that this can be done, I think it right to observe, that the practice should be received with caution, till, by further observation, it is ascertained, whether it proves beneficial or not. The best mode of doing it would be for the surgeons of those hospitals in which herniæ most frequently occur, to perform the operation a considerable number of times in each method, and to judge from the result, for we should not decide upon a point of such importance on the experience to be obtained from a few cases.

The chief objection to the practice is, that unless the hernial sac is laid open, we cannot possibly distinguish the state in which the parts contained in it are ; so that parts might be returned into the abdomen in such a state of disease as would add greatly to the hazard of the patient. The intestines are not only liable to mortify,

tify, but collections are sometimes found in the hernial sac, of a fetid putrid serum, which, on being pushed into the abdomen, might do much harm. And besides, it has sometimes happened, on laying open a hernial sac, that the cause of strangulation has been discovered, either in the sac itself, or among the parts contained in it: For although, in a great proportion of cases, a stricture of the passage through which the parts have come down, is to be considered as the cause of all the bad symptoms, yet instances of the contrary sometimes occur; one of which I met with some years ago, and I have heard of others of the same kind.—In a case of scrotal hernia of long duration, symptoms of strangulation at last supervened; and on laying open the sac, the appendix vermiformis was found so tightly twisted round a portion of gut, as left no reason to doubt of this alone being the cause of the mischief. If the parts had here been returned without dividing the sac, no advantage would have been derived from the operation;

operation; and, after death, the practitioner would have had the mortification to find, that the patient's life might have been saved, if this very necessary measure had not been omitted.

Instances of the protruded parts being returned into the abdomen without opening the sac, are enumerated by different French practitioners; and in some which ended fatally, it was found on dissection, that the strangulation of the gut had been the effect of stricture formed by the parts contained within the sac, and not by the tendon of the external oblique muscles through which they had passed.

Disasters of a similar nature having occurred to Mr Petit and others who had adopted the practice, it has long in France been very generally laid aside; but in a point of such importance, this will not be universally done till further experience shall evince whether it ought to be continued or not.

By some again, we are advised to reduce not only the protruded bowels, but
even

even the hernial sac itself; whilst others allege, that the sac can never be reduced. Mr Louis, in the paper I have quoted, is clearly of this last opinion, as Mr Pott also is. But we have the testimony of different authors of credit, and particularly of Mr Le Dran, to the contrary; and I have now met with it in more than one instance, where the appearances were so unequivocal as to leave no doubt with me respecting it.

In herniæ of long duration, where the parts have been long and repeatedly down, such firm adhesions usually form between the sac and the contiguous parts, as to reduce them apparently into one inseparable mass; so that, in such circumstances, all attempts to reduce the sac would be in vain. But although this would perhaps in every instance be the case in ruptures of long continuance, we are not warranted in supposing that it would be so in every case of recent hernia. We know that the adhesion of one part of the body to another, cannot any where be instantaneously

ly

ly produced. Even where recent division has taken place, and when the divided parts are kept in close contact, the space of some days is commonly required to produce a firm reunion. Now in the case of a portion of membrane being forced into a natural opening, where the parts are neither rendered raw by art, nor are as yet in a state of inflammation, a still longer period must be required for this effect; and in fact, although there is scarcely perhaps an instance of a hernial sac of long duration being reduced, yet there are sundry indisputable facts which show, that in recent ruptures it may be returned. In one of those to which I allude, the gut had been down five or six days, and formed a tumor in the groin of the size of an egg: The sac did not in any point seem to adhere; the operator therefore found no difficulty in reducing it; and on dissection after death, which happened in two days from the operation, the passage through the external oblique muscle was found dilated, but no existence of a
sac

fac could be traced into it. This also was the case with the other, which had been down for twelve or thirteen days. It is not, however, my own opinion, that this is a matter of much practical importance, I mean the possibility of reducing the hernial sac or not; for the reasons I have enumerated against the return of a hernia without opening the sac, occur with equal force against our returning the sac itself unopened.

The observations that I have hitherto made relate chiefly to hernia in the male subject; but as the same openings in the external oblique muscles exist in females, so they are also liable to the variety of rupture we have just been describing.

In males, however, the bubonocoele is more frequently met with than in women, and as in them too the cellular membrane surrounding the spermatic vessels is very lax and dilatable, so hernial swellings of this part are commonly much larger in them than in women. But instances sometimes occur, even in women, of the bubonocoele

nocele being of great bulk : I have known the protruded parts fall down to the very bottom of the labia pudendi.

As the openings in the external oblique muscles of females are exceedingly similar to those in the male, so the treatment, of bubonocèle is in them very similar to what is found to answer in men. When glysters, blood-letting, and the other remedies enumerated above do not succeed, the same operation of laying open the hernial sac, and enlarging the opening in the tendon of the oblique muscle, is here equally proper as in the other sex.

With modest women, herniæ often take place without the practitioner in attendance being made acquainted with them ; whenever therefore such symptoms of cholic occur in females as give reason to suspect the existence of hernia, a particular examination should always be made, in order if possible to discover the cause of the mischief, from the removal of which alone a cure can be obtained.

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In this manner, I have, in different instances, saved the lives of patients, who otherwise in all probability would have died, without the cause of their disease being known: With some women this would happen from delicacy alone; but instances also occur, of herniæ ending fatally, where the tumors are so small as scarcely to attract attention even from the patient.

SECTION III.

Of the Hernia Congenita.

FROM the anatomical description given in the first section of this chapter, of the parts chiefly concerned in hernia, it appears, that in the common hernia of the scrotum, the parts protruded from the abdomen must necessarily be contained in a bag or sac perfectly distinct from the testis: In that kind of rupture, the testis therefore remains in its usual situation, surrounded by its own proper membrane the tunica vaginalis, and not in contact with any other part.

But from the same description it appears, that if in early infancy a portion of gut should slip down by the same passage with the testicle, that the parts so protruded must be in immediate contact
with

with the testis, and must thus be contained in the tunica vaginalis ; so that in this rupture, very properly by Haller termed *Hernia Congenita*, the tunica vaginalis testis forms the hernial sac.

The discovery of this variety of hernia, which was reserved for modern times, enables us to account for a number of cases recorded in books of surgery, of the contents of ruptures being found in the same bag with the testicle ; a circumstance which, till this discovery, was considered as a clear proof of the peritonæum being frequently ruptured in hernia, as till of late this phenomenon could not otherwise be explained. But we now know, that the peritonæum is never ruptured in hernia ; and that the parts forming a hernial tumor being found in contact with the testicle, is a circumstance easily explained from the more accurate knowledge we have obtained of these parts.

The treatment of the congenital hernia should be nearly the same with that of bubonocoele in its more ordinary form.

When the parts can be replaced without an operation, it ought always to be done, a truss being at the same time recommended as a preventive of future descents; and when symptoms of strangulation take place, which cannot be otherwise removed than by the operation, it here becomes equally proper as in the common form of the disease.

When from a hernia having taken place in early infancy, and from the parts having continued to fall into the scrotum occasionally from that period downwards, there is reason to suspect that a rupture in which strangulation has taken place is of the congenital kind, the surgeon, in dividing the sac, should proceed with still more caution than in common hernia; for the tunica vaginalis which here forms the sac, is commonly much thinner than the usual sac of a hernia. On the parts being returned, more attention is also necessary in dressing the wound than in other cases of rupture; for the testicle being here laid bare by the vaginal coat being cut open,

open, if not treated with much delicacy it might probably inflame, and be thereby the cause of much additional distress and danger. The testis therefore should be immediately enveloped with its own proper covering, the loose tunica vaginalis ; and every dressing should be so conducted as to prevent with as much certainty as possible the external air from finding access.

In other circumstances the management of the hernia congenita is the same with that of any other rupture.

SECTION IV.

Of the Crural or Femoral Hernia.

THE seat of the crural hernia, as I have remarked above, is on the upper and anterior part of the thigh; the protruded parts passing out at the same opening through which the large blood-vessels of the thigh are transmitted from the abdomen.

In the description given in the first section of this Chapter, of the external oblique muscles of the abdomen, I remarked, that the under edge of these muscles, by doubling backwards, assumes the appearance of a ligament, extending in an oblique direction from the spine of the ileum near to the symphysis pubis, and forming what is commonly termed the ligament of Poupart or Fallopius.

Excepting

Excepting at its two extremities, where this ligament is attached to the pubes and ileum, it is not in any other part connected with bone. By the particular shape of the ileum at this part, a kind of arch is formed, by the ligament passing over a hollow in that bone, through which the large artery and veins of the thigh find a passage, the rest of the cavity being filled up with cellular substance, glands, and fat ; and all these parts again are covered with and tied down by a firm tendinous aponeurosis of the fascia lata of the thigh.

It is under the tendon or ligament just now described, that the parts composing a crural hernia descend. In some instances they pass immediately over the femoral artery and vein ; in others, they are found on the outside of these vessels ; but more frequently they lie on the inside, between them and the os pubis.

As the protrusion and strangulation of any of the contents of the abdomen, excites nearly the same symptoms, where-

ever this disease takes place ; so the symptoms of crural hernia are so similar to those described in the two first sections of this Chapter, that it is not necessary to mention them here.

The cure of the femoral hernia is also conducted upon the same principles with that of bubonocoele, described in the second section ; so that when symptoms of strangulation take place in it, the same remedies should be employed that were advised above for bubonocoele. Only here, in attempting to reduce the parts by the hand, the pressure should be made directly upwards, instead of obliquely outwards, as was advised in the other ; and when these means do not succeed, the operation itself must be employed.

In describing the operation for the inguinal hernia, I advised the external incision to be free and extensive. It is still more necessary in the crural hernia, from the parts concerned in it being more deeply seated. By timidity in making the first incision, the operator is frequently much
incommoded

incommoded in all the subsequent parts of the operation. The external cut should extend at least from an inch above the upper end of the tumor to the same length below the most depending part of it.

The membrana adiposa, tendinous [expansion of the fascia lata, and hernial sac, being all divided, if the protruded parts are found in a fit state for reduction, we should immediately attempt to replace them; and as the space below the ligament through which they have passed is considerable, this may commonly be done without dividing it, merely by pressure properly applied with the fingers, while the patient is placed in the posture directed above for the operation of the bubo-nocele as being best suited for favouring a return of the bowels.

When the contents of the tumor can be reduced without dividing the ligament, the patient is thereby saved from a good deal of hazard, as from the situation of the spermatic vessels and epigastric artery
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with respect to this ligament, any cut made into it is done with the risk of these vessels being injured.

The spermatic vessels in passing along towards the opening in the external oblique muscle, run nearly upon the very edge or border of Poupart's ligament, so that I consider it as impossible to make a free division of the ligament without cutting them across.

We have been advised indeed by some, in order to avoid the spermatic vessels, which they allow would be wounded, if the incision should be carried directly upwards, to cut in an oblique direction outwards. They admit, that in this way the epigastric artery may probably be divided; but the risk attending the division of that artery they do not consider as of much importance; and if the discharge of blood which it might produce should happen to be considerable, they speak of it as an easy matter to take it up with a ligature; for which purpose needles

needles of various shapes have been invented. Even in emaciated people, however, it is difficult to reach the epigastric artery with a ligature, and in corpulent patients it must often be impossible; so that the younger part of the profession should be cautious in receiving the directions usually given on this point. On reading the remarks of the late Mr Sharpe on it*, to secure the epigastric artery with a ligature, one would expect to be the easiest of all operations; but the difficulty which attends it, is such, as must convince all who have tried it, that Mr Sharpe himself never put it in practice.

But even although the epigastric artery could with certainty be avoided, if a hernia is large, the ligament is so much stretched as to bring the spermatic vessels so nearly on a line with the under edge of it, as to render it altogether impossible to divide the one without the other; and whoever will examine these parts in this situation,

* Critical Inquiry into the present state of Surgery.

situation, will see that this cannot be avoided, whether the incision is carried directly upwards, or obliquely outwards or inwards.

Some who have been sensible of the danger attending this part of the operation, have proposed merely to dilate the passage instead of dividing the ligament; and Mr Arnaud, a French author, delineates a curved levator for the purpose of supporting the ligament till the protruded parts are reduced: but as we are to suppose in every case of strangulated hernia, that the passage through which the parts have fallen down is already dilated to nearly its utmost possible extent, in such a situation to attempt a farther dilatation, without the assistance of the knife, would seldom, it is probable, answer any good purpose.

A considerable time ago it occurred to me, that in this part of the operation some assistance might be derived from performing it in the following manner; and having since had occasion to put it
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in practice with success, I can now with some confidence recommend it. Instead of dividing the ligament in the ordinary way, from below upwards, I make a slight incision into it, about an inch in length, beginning above and proceeding to the under edge of it.

The first scratch with the scalpel should be slight ; but by repeated touches, it should be made to penetrate almost through the whole thickness of the ligament, till at last only a thin layer of it remains : In this situation the protruded parts may for the most part be returned with ease, as the ligament where thus weakened by the incision will yield gradually to the pressure applied for the reduction of the intestines.

As in this manner the opening may be enlarged to any necessary extent, and as the spermatic vessels and epigastric artery are thus avoided, the operation may not only be done with equal certainty, but with the same safety, as for any other rupture. For, by not penetrating with
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the scalpel through the whole thickness of the ligament under which these bloodvessels lie, they are thereby kept free from danger during this part of the operation; and the pressure afterwards used for the reduction of the protruded parts, if done in a gradual manner, can never injure them materially, as bloodvessels of the size and strength of these easily admit of much more extension than is here required.

In every other circumstance, the crural hernia, as I have observed already, requires the same method of treatment with bubonocoele, for which the second section of this Chapter may be consulted: Only I may remark, that the dressings are more easily retained after this operation, by a piece of leather spread with plaster moderately adhesive, than with any kind of bandage.

I have already observed, that the crural hernia is more frequent in women than in men, owing to the particular conformation

formation of the parts in which it occurs. In women the same mode of operating should be observed as in men; for as in them there is the same risk of wounding the epigastric artery, the same precautions are necessary for avoiding it, and by attending to the directions given above, it may be always done.

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SECTION V.

Of the Exomphalos, or Umbilical Rupture.

IN this variety of hernia, the parts protruded from the abdomen pass out at the umbilicus; and the contents of the hernial sac are here, as in every other rupture, exceedingly various. In some instances they consist of intestines only; sometimes of omentum only; and frequently of both. In some, part of the stomach, liver, and spleen, have been found in the sac of an umbilical rupture.

As all these parts are naturally contained in the peritonæum, the hernial sac, it is evident, must here as in other ruptures be formed by that membrane being carried along with such parts as are protruded. Accordingly, in every recent instance of umbilical hernia, this sac is
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in general evident; but when the tumor is large, the sac becomes so intimately connected with the contiguous parts, in consequence of the weight and pressure of its contents, that many have doubted whether this species of hernia has a sac or not. In some instances the tumor has increased to such a degree, as actually to burst the surrounding parts; not only the sac, and cellular substance, but even the skin itself.

Umbilical herniæ occur most frequently in early infancy, and in corpulent people more frequently than in others, from this obvious reason, that by the great bulk of parts contained in the abdomen of fat people, the surrounding muscles are kept constantly distended, by which the opening at the umbilicus, through which the parts are protruded, is made more pervious: For a similar reason, women in the last months of pregnancy are particularly liable to this rupture.

If attended to in due time, a right bandage will commonly effect a cure;

and, when produced by pregnancy, a temporary removal of the disease, is, in general, a certain consequence of delivery. While a woman continues pregnant, we can seldom remove an umbilical rupture, but by employing a bandage early we can in this situation prevent the tumor from becoming larger.

Although different portions of the alimentary canal are occasionally met with in umbilical ruptures; yet by experience we know, that most frequently they contain omentum only: hence umbilical herniæ are not in general so hazardous as other ruptures.

It happens, however, as I have observed above, that in some cases a portion of gut alone is pushed out, by which the usual symptoms of strangulation are apt to be induced. In this situation, when the means usually employed for returning the gut do not succeed, as a stricture of the passage through which it has fallen, is to be considered as the sole cause of the danger; so a cure, it is evident, must depend

depend entirely on this being removed. In performing this operation, a free external incision along the course of the tumor is the first step to be taken; and on laying the protruded parts bare by a cautious division of the sac, if they are found in a state fit to be returned, and if this cannot be effected but by enlarging the passage into the abdomen, it may be done with safety by introducing the finger, and enlarging the opening with a blunt-pointed bistoury. This incision, I may remark, may be made with almost equal safety in any direction; but lest the ligament formed by the umbilical vessels should be wounded, which, however, would not probably do much harm, yet when an operator is of a different opinion, it may always be avoided by making the cut on the left side of the umbilicus, and carrying it a little obliquely upwards and outwards.

When, again, the prolapsed parts, on being laid open, are found to be so much diseased as to render their reduction im-

proper, the directions formerly given for similar occurrences in other cases of hernia, will apply with equal propriety here, and need not now be repeated.

By Albucasis, Guido, Aquapendens, and others, it has been proposed, with a view to obtain a radical cure without the operation, to lift up the skin covering the tumor, with the finger and thumb, so as to separate it from the gut beneath; and a cord being passed round the parts thus raised up, a ligature to be made so tight as to induce mortification over the whole of them.

In other instances again, when the form of the swelling did not admit of this, the same precaution being taken for avoiding the gut, a needle containing a double ligature was introduced through the basis of the tumor, near to its centre, and the ligatures afterwards tied one above and the other below, of such tightness as to induce the wished-for effect.

But as the practice thus recommended did not answer the purpose, for it did not prevent a return of the disease, and as the
destruction

destruction of skin rendered every future descent more dangerous, so it is now, at least by regular practitioners, very universally exploded.

In Plate LXV. fig. 3. is represented the best bandage I have used for umbilical herniæ.

SECTION VI.

Of Ventral Herniæ.

IN ventral hernia the parts forming the tumor are protruded between the interstices of the abdominal muscles. No part of the abdomen is altogether exempted from these tumors, but they are most frequent in the parts most contiguous to the linea alba; and when the stomach alone forms the tumor, the swelling is situated just under, or immediately to one side of the xiphoid cartilage.

The treatment of this rupture corresponds with that of exomphalos. When the parts are reducible by the hand alone, a cure may be frequently obtained by the constant use of a truss; and, again, when symptoms of strangulation occur, which cannot be removed but by an incision through the stricture, this must be done
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in the manner pointed out in the last section, so as to admit of the parts being replaced. The after-treatment of the parts concerned in the operation, is the same here as in the umbilical rupture.

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SECTION VII.

Of the Hernia of the Foramen Ovale.

IN this rupture, the viscera protrude through the foramen ovale of the pubis and ischium. It is not a frequent variety of the disease; but as it has been met with, it is necessary to describe it.

The symptoms of this hernia being very similar to those arising from strangulated intestines in other parts, they need not be enumerated here: Only it is proper to remark, that in this rupture the tumor is in men formed near to the upper part of the perinæum; and in women, near to the under part of one of the labia pudendi. In both sexes it lies upon the obturator externus, between the pectineus muscle and the first head of the triceps femoris.

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The foramen ovale being partly filled up by a membranous or ligamentous substance, and in part by the obturatores muscles, it was commonly supposed that this species of hernia arose from a relaxation of one or other of these; but as an opening is left in the foramen for the transmission of different bloodvessels and nerves, it is now known, that in this rupture the viscera pass out at that opening, by gliding down in the course of these vessels.

The general mode of treatment pointed out in the preceding sections for other herniæ, must be here kept in view; and when the parts are reduced, a truss properly adapted to the parts, must be trusted to for retaining them. But, as it will sometimes happen in this, as in every other hernia, that the parts cannot be reduced with the hand alone, when this is found to be the case, it must be done by dilating the passage through which they protrude. The tumor, however, that takes place here, being in general so small as scarcely

scarcely to be noticed but by the most minute attention, unless a local pain, with the usual symptoms of a strangulated gut happen to lead to it, it is seldom discovered from its size, till it is too late to expect much assistance from art.

But, whenever the operation becomes necessary, as it must always be when symptoms of strangulation arise from a portion of protruded gut that cannot by any other means be reduced, after carefully laying the prolapsed parts bare, if they cannot be reduced but by dilating the passage, and as death must ensue if reduction cannot be accomplished, it ought undoubtedly to be attempted: But as it is almost impossible to enlarge this opening with an instrument, without dividing some of the bloodvessels that pass out at the foramen; and as this would probably end in the death of the patient, the depth and situation of the parts rendering the application of a ligature impracticable; it is more advisable, by means of a flat hook, to dilate the passage to a sufficient size,
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by gentle gradual stretching. By insinuating the end of the hook between the intestine and ligament, and pulling it gradually upwards, a degree of dilatation may be obtained, sufficient for the reduction of the gut, without incurring that hazard which the division of the ligament with the knife or any sharp instrument must always occasion. A hook for this purpose is delineated in Plate LXXVIII. fig. 2.

S E C.

SECTION VIII.

Of the Hernia Cystica, or Hernia of the Urinary Bladder.

IN this rupture, the urinary bladder is the organ protruded; and the situations in which it occurs, are either the groin and scrotum through the opening in the external oblique muscle of the abdomen; the fore-part of the thigh under Poupart's ligament; or the perinæum through some of the muscular interstices of that part*. Instances have likewise happened, of the bladder being pushed into the vagina, so as to form hernial tumors of considerable bulk.

As only a part of the bladder is covered with the peritonæum; and as the bladder,

* An instance of this is recorded in vol. iv. of Mémoires de l'Académie Royale de Chirurgie, by Mons. Pipelet le Jeune, p. 181.

der, in order to get into the opening in the external oblique muscle, or under the ligament of Fallopius, must insinuate itself between that membrane and the abdominal muscles, it is evident, that the hernia cystica cannot be covered with a sac, as intestinal ruptures usually are. In the perinæum, again, that portion of the bladder most liable to fall into it, is in no way connected with the peritonæum.

In some instances, this rupture occurs by itself, without any complication; and in others it is accompanied with intestines and omentum, both in inguinal and femoral herniæ: When complicated with a bubonocoele, the protruded portion of the bladder lies between the hernial sac and spermatic cord; that is, the intestinal hernia lies anterior to it.

The usual symptoms of this hernia are, A tumor, attended with fluctuation, either in the groin, in the fore-part of the thigh, or perinæum, which gradually subsides when the patient voids urine, and becomes

comes larger when the bladder is full. When the tumor is large, before water can be passed with freedom, it is commonly necessary to employ pressure, at the same time that, when in the groin or thigh, the parts require to be as much elevated as possible; but when the tumor is small, and especially when no stricture has taken place, the patient generally voids urine easily, and without assistance from external pressure.

When a hernia of the bladder takes place without any complication, it commonly proceeds from a suppression of urine. In the method of cure, therefore, every cause of suppression should, as far as possible, be guarded against; and if the protruded portion of bladder can be reduced, a truss properly fitted to the part, should be worn for a considerable time. But when the parts cannot be reduced, as long as no symptoms appear to render the operation necessary, a suspensory bag, so fitted as effectually to support the tumor without compressing it,
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is perhaps the only remedy we should employ.

When, again, a portion of bladder protrudes into the vagina, after reducing the parts, which we do by laying the patient on her back, with her loins elevated, and pressing with the fingers from the vagina, descents in future may, in general, be prevented by the use of the pessary represented in Plate LXXIV. fig. 2. And the same means, I may remark, are employed with success, in preventing descents of the intestinal canal into the vagina ; a species of rupture sometimes met with.

It may happen, however, if inflammation occurs here, that the division of the parts producing the stricture will be as necessary as in any other rupture. In which event, the mode of operating pointed out in the preceding sections should be kept in view.—Only it must be remembered, that as in the hernia cystica without any complication, the protruded parts are not covered with a sac, so still more
caution

caution is required in laying them bare, than is necessary in common ruptures.

It sometimes happens, that stones are produced in the protruded portion of the bladder. In which event, if it should ever be necessary to cut into them, if the bladder can be easily retained in its prolapsed state till the wound is healed, it ought always to be done, in order to prevent that internal extravasation of urine which otherwise would occur, and which certainly would do harm. The same precaution is necessary, when by accident in the operation for the hernia cystica, the bladder is opened; or when any part of it is in a state of mortification, and therefore unfit to be returned into the abdomen*.

* The best accounts of all the varieties of hernia are to be met with in the works of Le Dran, Heister, and of Mauchart, in a *Treatise de Hernia Incarcerata*; in the different volumes of *Mémoires de l'Académie Royale de Chirurgie de Paris*; in the *Medical Essays of Edinburgh*; in the works of the late Dr Monro; in *Haller de Hernia Congenita*,

Congenita, in his *Opuscula Pathologica*; in Mr John Hunter's very accurate account of the state of the testis in the foetus, to be met with in Dr Hunter's *Medical Commentaries*; in Mr Pott's and Dr Richter's valuable works on this subject. These are the best modern authors on this subject; and very little satisfaction is to be obtained from any of the ancient writers upon it.

CHAPTER XXIV.

On the HYDROCELE.

SECTION I.

General Remarks on the Hydrocele.

EVERY tumor formed by a collection of water, may, from the import of the word, be called a hydrocele, but, in surgical language, the term implies a watery swelling in the scrotum or spermatic cord.

This, as well as all tumors in the scrotum or groin, not immediately produced by

by the protrusion of parts from the abdomen, were, by ancient writers, termed false or spurious herniæ, from the resemblance which they bear to the true hernia, or rupture; but no advantage is derived from this distinction: And, as it arose from an erroneous opinion of the origin of herniæ, I should not have taken notice of it here, but with the view of making the writings of the ancients upon this subject intelligible.

Indeed, the doctrines of the writers of the last and preceding centuries, concerning hydrocele, are so confused and perplexed, that they do not merit attention; for, as they were ignorant of the anatomy of the parts in which the disease is seated, the ideas which they formed of it, gave rise both to an erroneous pathology and pernicious practice. Not being acquainted with the structure of the parts affected, they proceeded with much unnecessary dread in the treatment of the diseases to which they were liable; for, by supposing an immediate connection to subsist be-

tween the coats of the testicle, the cavity of the abdomen, liver, kidneys, and other viscera, they were induced to consider the collection of water in hydrocele, as a deposition from these parts, and as tending to free them, and perhaps the system at large, from diseases of importance.

In consequence of this, their practice was timid and indecisive; so that every surgical operation, in which these parts were concerned, became a matter of much importance to resolve upon, and very tedious, painful, and uncertain in the execution.

From the time of Celsus to the middle of the last century, little progress seems to have been made in this part of surgical pathology. Indeed, from Celsus downwards, authors seem to have copied almost exactly from one another, till Wiseman, Le Dran, Garangeot, and Heister, gradually elucidated the subject: but it was not clearly understood till the discoveries of Monro, Haller, Hunter and Pott, made the anatomy of the parts plain
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and intelligible. So much attention, however, is still given to the confused accounts of ancient writers, that the real nature of the diseases of the testes, and their appendages, is, from this cause alone, less understood than it otherwise would be. There is perhaps no part indeed of surgery with which students in general are so little acquainted.

Nothing but a strict attention to the discoveries of late anatomists, can convey clear and distinct ideas concerning them; and, whoever will make himself acquainted with these, will find, that the hydrocele and affections of the testes, may be explained with as much clearness and simplicity as any other class of diseases. In the first Section of Chapter XXIII. I gave a description of these parts, in so far as was necessary for the consideration of hernia. Referring to what I had then occasion to say, commencing in page 254, and ending page 266, I have now only to add what may be necessary for understand-

ing more completely the diseases of the testes, and their tunics.

As from the forefaid description it appears, that the testis while in the abdomen is firmly attached to the peritonæum behind, so, when in the scrotum, as the vaginal coat with which it is there surrounded, is evidently a continuation of the peritonæum, it must of necessity be still connected with that membrane, in the same manner as while it remained in the abdomen. And accordingly we find, that, although the testicle lies loose in this sac, or vaginal coat, in every other part; yet, along its posterior part, it is firmly attached to it. At this part, the different vessels of the testis still enter; and at this the peritonæum, or what is now the tunica vaginalis, is reflected over it, and every where closely attached to it, thereby forming the tunica albuginea, or immediate covering of the testicle; so that the tunica albuginea is demonstrably a mere continuation of the other, or vaginal coat.

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The inferior part of this process of the peritonæum being somewhat wider below than above, leaves the tunica vaginalis of a pyramidal form; and it is also somewhat longer than the testis, reaching from the superior part of the epididymis, where it begins, to a little below the inferior point of the testicle, where it terminates. It is altogether of such a size as to allow the testis to roll easily within it; its principal use appearing to be, to retain a small quantity of a fine exhalation, which is constantly secreting, either from its own surface, or from the surface of the testis itself, for the purpose of keeping the latter moist and easy.

The vaginal coat, of which I have thus given a description, is the only loose covering belonging either to the spermatic cord or testis: For although, by many, a vaginal coat of the spermatic cord is also described, together with a supposed septum between it and the vaginal coat of the testis, yet no such covering is, on dissection, found to exist. The upper part

of what may be called the spermatic process of the peritonæum, is evidently closed, as has been described above, soon after the descent of the testicle; and a firm adhesion taking place between the cord and that part of the sac with which it is enveloped, no vestige can be traced, either of a vaginal coat of the spermatic cord, or of any particular septum between this coat and the testicle: This, it is of importance to notice, as the diseases of these parts cannot otherwise be understood.

As the diseases we are now to consider are chiefly seated in the coverings of the testis, I have given a more particular account of them, than is necessary in speaking of the testis itself; with respect to which, I shall only observe, that it is evidently very vascular, being composed almost entirely of different convolutions of vessels.

Besides the vaginal coat proper to each testicle, the two testes have for their further protection, a more external covering,
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the scrotum ; a bag formed almost entirely of skin and cellular substance ; for that body, the dartos, which has been commonly described as muscular, is now clearly proved to be altogether cellular. Even the septum scroti, or that membrane which divides one testicle from another, is composed of cellular substance in a more condensed state. By air it is easily inflated, and it is also pervious to water ; so, of course, it partakes of all those watery effusions, to which the more external parts of the scrotum are liable.

This structure of the scrotum it is necessary to be acquainted with, as, from the descriptions which, till of late, have been given of it, young practitioners are induced to consider it as muscular, and to suppose that the septum, with its rapha, are ligamentous ; and hence they are led to be more cautious than they need be in performing operations on this part.

Having thus premised an account of the anatomy of the parts in which the water in hydrocele is collected, I shall
now

now proceed to consider the different varieties of the disease.

All the varieties of hydrocele which have been mentioned by authors, may, I think, be comprehended under the two following, the Anasarcous, and Encysted.

In the former, the serum is diffused over all the substance of the part in which it is seated ; it is not collected in any particular cavity, but occupies equally all the cells of the part : In that which I term encysted, the water is collected in one distinct bag, and a fluctuation of a fluid is, in general, perceived in it. The scrotum, with its contents, the testicle and its appendages, are liable to both varieties of the disease ; and the spermatic cord, with its coverings, are also liable to both. We shall first consider those of the scrotum.

SECTION II.

Of the Anasarcous Hydrocele of the Scrotum.

THE scrotum, from its cellular structure, and immediate connection with the trunk of the body, is apt to partake of every diffusible swelling with which the upper part of the body is attacked: And, accordingly, we find, that general anasarcous swellings seldom subsist for any length of time, without affecting the scrotum. A local anasarca of the scrotum, is sometimes indeed produced by a local cause, to wit, by the pressure of a tumor on the lymphatics of the part; by external injuries; and occasionally by an effusion of urine from a rupture of the urethra: But such occurrences are rare; a general disease of the constitution being the usual forerunner of these tumors.

As

As soon as water has collected in any considerable quantity in the scrotum, a soft, inelastic, colourless tumor is observed over the whole of it; impressions are easily received and retained for some time; the skin at first preserves its natural appearance; and the rugæ of the scrotum, which, in a state of health, are obvious, are not for some time much altered; but as the swelling advances, the rugæ gradually disappear, till at last they are totally obliterated: The tumor, from being at first soft, and of a consistence similar to dough, by degrees turns more firm, and the skin at last acquires an unnatural white shining appearance. At length it becomes large; and although originally confined to the scrotum, it at last spreads up the groin: The penis likewise becomes affected, and often so swelled and distorted, as to excite much inconvenience and distress; and although the scrotum is composed of parts which readily admit of dilatation, yet, in some instances, the tumor becomes so enormous,

mous, as to burst from one end to the other.

These appearances of the disease are so characteristic, as to render it almost impossible to confound this species of hydrocele with any other tumor of the scrotum.

I have already observed, that instances sometimes occur, of the scrotal anasarca being produced by a local cause; but, in a great proportion of cases, it is induced by a general tendency to dropsy; so that the cure will chiefly depend upon the removal of that habit of body, by which it was at first produced.

The treatment of this disease of the system falls to the province of the physician, so that I shall not enter upon it at present; but the aid of surgery is frequently required, for relieving the distress which these tumors always induce when they become large. In these circumstances, the object of surgery is, by drawing off the water, to diminish the size of the tumor, or even to remove it altogether,

altogether, which not only gives much immediate relief, but is a means of the distended parts recovering their tone more readily than they otherwise would do. Different methods have been proposed for evacuating the water; the introduction of a seton, passing a trocar, incisions, and punctures.

All of these, excepting that by the trocar, serve very effectually to evacuate the diffused water; and therefore we are to adopt that which not only excites least pain, but which is least liable to produce troublesome consequences; and this unquestionably is the method by punctures.

The seton and long scarifications may discharge the water more quickly than punctures; but in dropfical constitutions, such as the anasarcaous hydrocele is commonly connected with, they almost constantly do harm. For the first two or three days, scarifications give the patient much satisfaction: the water is almost entirely discharged, the tumor is of course greatly diminished, and much relief is thereby

thereby obtained. About this time, however, the scarified parts commonly begin to fret, their edges turn hard and inflamed, and by degrees, an erysipelatous redness spreads over the neighbouring parts.

That fretful uneasiness at first complained of, terminates at last in what the patient terms a burning kind of pain, which frequently becomes so tormenting, as entirely to destroy rest; and it too commonly happens, that all our remedies fail in preventing the accession of gangrene, by which the patient is in general carried off.

I will not say that scarifications always end in this fatal way; but I have in many instances found that they did so; and, on the contrary, although punctures sometimes terminate in the same manner, they are by no means so ready to do so.

As scarifications are so apt to do harm, there is much reason to suspect that the trocar and seton, which both excite still more irritation, would prove still more hurtful.

hurtful. They are now, accordingly, in the anasarcaous hydrocele very generally laid aside.

When scarifications are to be employed, we make them with the shoulder of a lancet: they should penetrate the cutis vera, but should not be carried to a greater depth, and they should not exceed an inch in length: punctures should be carried to the same depth; and they, as well as scarifications, should be always on the most prominent and most depending parts of the tumor: Punctures are best made with the point of a lancet: five or six are commonly sufficient at once; but as they are apt to heal before the serum is all discharged, they require from time to time to be renewed.

Preserving the parts dry, by a frequent renewal of dry linen cloths, in order to imbibe the moisture, is here a very necessary attention; indeed, the want of it seems often to be the cause of much of the mischief that ensues from this operation.

When

When either scarifications or punctures go wrong, by beginning to inflame and turn painful, instead of the warm emollient poultices and fomentations usually employed, a cold saturnine solution applied upon soft linen, not only proves more effectual in putting a stop to the inflammation, but affords more immediate relief to the present distress. Lime water, employed in the same manner, proves also an useful application.

Mortification, however, will take place in some instances, notwithstanding all that we can do to prevent it: In this case, we trust chiefly to the internal use of bark, wine, and other tonics, and to warm dressings and other external applications usually employed in gangrene: As this variety of gangrene is almost always accompanied with much irritation, I often give opium with advantage: Opium proves chiefly useful, by removing pain and general irritability; but as we know from experiment, that it acts as an antiseptic, it may in some cases stop the progress of

gangrene, by acting directly on the diseased parts.

In a great proportion of cases, the utmost danger is to be dreaded from the punctured parts being attacked with gangrene; yet, in a few instances, very unexpected cures are obtained, after all the teguments have been destroyed by it. A remarkable instance of this occurred some years ago, in the Royal Infirmary here: The whole scrotum separated, and left the testicles bare. During the time that the sore remained open, all the water collected in other parts of the body was evacuated, and, by the use of large quantities of bark, and mild dressings to the sore, the patient got well. In the course of the cure, the testes became enveloped with a thick cellular substance, which served as a very good means of protection. It must have been some similar production, I suppose, which Hildanus speaks of as a regenerated scrotum*.

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* *Observat. Chirurg. Cent. 5. Obs. 76.*

I have already observed, that, although the anasarcaous hydrocele depends, for the most part, on a general tendency to dropfy, that some instances, however, occur, of a local cause producing a mere local dropfy of the scrotum. Thus it has, in some instances, arisen from tumors in the groin and abdomen obstructing the passage of the lymphatics. In this case, if the tumors producing the obstruction can be extirpated, no other means will afford such effectual relief; but, when so deeply seated as to render any attempt for removing them unsafe, the practice I have pointed out, of making punctures in the most depending part of the tumor, must be employed, from time to time, to palliate the symptoms.

It has sometimes happened, in suppression of urine, whether arising from strictures in the urethra, or from stones impacted in it, that the urethra has burst, and the urine, in this manner, getting access to the cellular texture of the scro-

tum, an anafarcous swelling rises immediately over the whole of it; nor does it commonly diminish till the cause by which it is produced is removed.

In order to prevent the formation of sinuses, which, in such circumstances, will otherwise be apt to occur, an incision should be made into the most depending part of the scrotum, and carried to such a depth as is sufficient for reaching the wound in the urethra. In this manner, a free vent will not only be given to the urine already diffused, but the further collection of it may probably be prevented. If a stone impacted in the urethra is found to be the cause of the effusion, it should be cut out; and, if the obstruction is produced by strictures, they must be removed by a proper use of bougies. The cause being thus removed, if the habit of body of the patient is good, and untainted with any venereal or other general affection, by dressing the sore properly, with soft easy applications, the opening in the urethra will probably heal,
and

and a complete cure will, in this manner, be obtained. But when these ailments are complicated with any general affection, particularly with lues venerea, neither mercury nor any other internal medicine, will remove them.

Cases of this kind must have occurred to every practitioner. I have met with them, both in the Hospital and in private practice; where, notwithstanding all the internal remedies that were employed, the passage from the urethra remained open, and continued to afford a vent to the urine. In such cases, we depend chiefly upon a proper application of bougies.

The scrotal anasarca, of a local nature, has also happened from the rupture of a hydrocele of the tunica vaginalis testis: When the hydrocele of the tunica vaginalis arrives at a great size, jumping from a height, or a violent blow or bruise, will readily burst it; and the water, not finding a passage outwardly, must necessarily diffuse itself over the scrotum. Different instances of this have been met with,

two of which are related by Douglas *; and others have fallen within my own observation. A swelling of a similar kind is also sometimes induced by the water of a hydrocele of the tunica vaginalis being improperly drawn off in the operation of tapping. When the orifice in the skin is allowed to recede from the opening in the vaginal coat before the water is all discharged, as is apt to happen when the operation is done with a lancet, the remainder of the collection diffuses itself through the cellular substance of the scrotum, an inconvenience that may be always prevented, by using a trocar for this operation, instead of a lancet.

In whatever way the swelling is produced, the cure should consist in laying the tumor sufficiently open, not only for evacuating the diffused serum, but for effecting a radical cure of the hydrocele of the tunica vaginalis.

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* Treatise on the Hydrocele, by John Douglas, p. 8.

Some have imagined, that danger may ensue from performing the radical cure for the hydrocele in this situation; but I have done it in different instances, and no harm has ever ensued from it. The patient, in some cases, may decline the operation, and, in others, his habit of body may render it improper; but, when this does not happen, few will doubt of its being better to give a patient, in such circumstances, immediate and effectual relief, by performing the radical cure at once, than to subject him, in the first instance, to a good deal of confinement, for removing the diffused swelling of the scrotum, and to leave him under the same necessity as before, of submitting to the radical cure for the hydrocele of the tunica vaginalis.

When, for either of the reasons, however, that I have mentioned, this operation is not to be performed, we endeavour to assist the discussion of the tumor, by suspending the scrotum; confining the patient to a horizontal posture; and by

the application of astringents to the parts affected. Of these we have a great variety; but I have found none answer so well, as a cold solution of crude sal ammoniac, in the proportion of half an ounce of the salt to a pound of water and two ounces of vinegar; or poultices, prepared with crumb of bread, soaked in equal parts of cold water, vinegar, and brandy.

I have thus considered all the varieties of anasarcaous tumors, to which the scrotum is liable, together with the mode of treatment that appears to be adapted to each of them; for, with respect to the hydrocele of the dartos, a disease particularly described by ancient writers, as that part of the scrotum is now known to be entirely cellular, so any water collected in it must tend to form that very disease we have just been describing, an anasarcaous swelling of the whole scrotum.

We now proceed to consider that species of hydrocele which, from being seated

ed within the cavity of the scrotum, may be termed the encysted hydrocele of the scrotum. Of this there are two varieties, the hydrocele of the tunica vaginalis testis, and that species of tumor formed by water collected in the sac of a hernia.

S E C-

SECTION III.

Of the Hydrocele of the Tunica Vaginalis Testis.

WHEN treating of the anatomy of these parts, I had occasion to remark, that, in a state of health, an aqueous secretion is always found in the tunica vaginalis ; the principal use of which seems to be, to lubricate, and keep the surface of the testicle soft and easy.

In a state of health, this fluid is absorbed by the lymphatics of the part, its place being supplied by a fresh secretion ; but, in disease, it frequently happens, either that the secretion of this fluid is morbidly increased, or the powers of the absorbing vessels of the part are diminished. The effect of either of these causes must be, to induce a preternatural collection in the

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the cavity of the vaginal coat ; and thus the variety of hydrocele is produced that we are now to consider.

The symptoms induced by it are these : A soft colourless tumor is at first perceived at the inferior point of the testicle ; chiefly remarkable when the patient is erect : It excites no pain, and it does not become less by pressure. The shape of the tumor is at first nearly globular ; but it afterwards becomes pyramidal, being larger below than above : As it advances in size, it becomes proportionally more tense, and the natural rugæ of the scrotum less perceptible. For a considerable time, it does not extend farther than the usual boundaries of the scrotum ; but, on longer continuance, it advances to the abdominal muscles : so that, although in the early periods of the disease, the spermatic cord may be distinctly felt ; in its more advanced state, it is not easily distinguished.

Before arriving at this height, the weight of the tumor is for the most part
considerable,

considerable, by which the skin of the contiguous parts is dragged so much downwards, as to make the penis shrink considerably, and sometimes disappear almost entirely. In this advanced state of the disease, the testicle, which usually lies at the back-part of the tumor, and which, for some time after its commencement, could be distinctly felt, is not so clearly discovered. On minute examination, however, a hardness may always be felt along that part of the scrotum where the testis is situated; and at this point, pressure excites some degree of uneasiness.

In a great proportion of cases, the fluctuation of a fluid is obviously distinguished on pressure. It sometimes happens, however, in that tense state of the tumor, usually produced by a long continuance of the disease, that the fluid contained in it is not evidently discovered: Nor, in this situation, is the ordinary characteristic mark of hydrocele more to be depended on; I mean the transparency of the tumor, when exposed to the light of a candle,

candle, or of the sun. In the early stages of the disease, when the contents of the tumor are not discoloured, and the vaginal coat has not acquired much thickness, the fluid contained in it, on being exposed to this trial, usually appears transparent; and, in meeting with this, we necessarily consider it as a corroborating proof of the existence of serum. The absence, however, of this, is not a proof of the contrary; for, as the transparency of the tumor depends entirely on the nature of its contents, and on the thickness of its coverings, whatever tends to render the one less clear, and the other of a more firm texture, must, in proportion to this effect, invalidate the certainty of the test.

During the whole continuance of the disease, the patient does not complain of pain in the tumor itself; but some uneasiness is commonly felt in the back, by the weight of the tumor on the spermatic cord. This, however, is generally prevented entirely, or much alleviated, by the use of a suspensory bandage.

These

These are the usual appearances of a hydrocele when confined to one side of the scrotum. In some instances, however, we meet with a double hydrocele, when the tumor occupies the cavities of both tunicae vaginales, and instead of being confined to one side of the scrotum, extends equally over the whole of it.

As this variety of hydrocele is sometimes confounded with other diseases, it is particularly necessary to hold such circumstances in view, as most certainly tend to characterize and distinguish them. These diseases are, all the varieties of scrotal herniæ; the anasarcaous hydrocele of the scrotum; the encysted hydrocele of the spermatic cord; the sarcocoele, or schirrous testicle; and the hernia humoralis, or inflamed testis.

In the hydrocele of the tunica vaginalis, the tumor begins at the bottom of the scrotum, and proceeds slowly upwards. It is of a smooth equal surface. In a great proportion of cases the spermatic cord is felt at the upper part of it, and the fluctuation

tion of a fluid is distinguished through its whole extent. Pressure does not make the swelling recede, nor is it affected by the posture of the patient, if it be not on its very first approach; whereas, in hernia, besides pain, sickness, and other affections of the stomach and bowels which commonly take place, the tumor begins in the groin, and only at last proceeds to the scrotum. It has not the pyramidal form of a hydrocele. It is frequently soft and compressible, giving a sensation similar to what we receive from pressure upon dough; but no equal or distinct fluctuation is perceived in it. In most instances, the tumor can be made to recede, either altogether or in part, by moderate pressure, and putting the patient in a horizontal posture; and in hernia descending to the scrotum, the spermatic cord can never be clearly distinguished.

However improbable it may appear, this variety of hydrocele has, in some instances been confounded with anasarcaous tumors of the scrotum; but the means of distinction

distinction are so evident, from the history which I have given of the two diseases, that it is not here necessary to enter farther upon the subject. It must, indeed, be gross inattention only that can ever make the anasarcaous hydrocele be mistaken for any other disease.

From the encysted hydrocele of the spermatic cord, it may commonly be distinguished by the testicle in the latter being plainly felt at the under part of the tumor; whereas, in this disease, the testis is seldom distinctly perceived if it be not at the back-part of the tumor. In two cases, I have met with the testicle on the anterior part of a hydrocele; and, in a third, although fixed behind in its usual situation, it also adhered at one point to the middle and anterior part of the tunica vaginalis. This I suspected to be the effect of inflammation, induced either by hernia humeralis or some other disease; and on inquiry, it appeared that the patient at one time had been long confined with inflammation of this testicle, the effect of a bruise.

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In the encysted hydrocele of the cord, the tumor first appears above the testicle, and by degrees falls downwards; while the very reverse happens in the hydrocele of the tunica vaginalis, in which the tumor at first always forms below, and from thence proceeds upwards.

In a few instances, these two varieties of hydrocele have been known to exist at the same time in the same patient. In this case the serum, although collected in two distinct cysts, gives the appearance of one uniform tumor; and a fluctuation is distinctly felt from one end of it to the other. But, in any instance that I have seen of this combination, the tumor has been somewhat contracted, having rather a less diameter at that part where the two collections are separated from each other; so that, where this appearance takes place, we may, in general, suspect that the serum is collected in two distinct bags. This, however, does not always happen; for occasionally I have met with this appearance

where the disease was fixed in the tunica vaginalis alone.

The circumstances which most clearly distinguish hydrocele from a schirrous testicle are these : In the latter the swelling is hard ; it does not yield in any degree to pressure ; the surface of the tumor is commonly rough and unequal ; it is in general attended with a good deal of pain, and is always heavy in proportion to its size : Whereas, in hydrocele, the swelling commonly yields to pressure ; its surface is smooth ; little or no pain takes place ; and the tumor is light in proportion to its bulk.

These differences will always serve as a sufficient means of distinction between this species of hydrocele and a pure unmixed sarcocoele. But when a schirrous testicle is combined with an effusion of water into the tunica vaginalis, forming what has very properly been termed a hydro-sarcocoele, the means of distinction are not so obvious. In the incipient state of these effusions, the difference between
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the two diseases is sufficiently apparent ; but, when far advanced, the most attentive observer often finds it difficult, and sometimes impossible, to mark the distinction. In such doubtful cases, however, by proceeding in the cautious manner to be afterwards pointed out, no detriment will occur to the patient, from any uncertainty that may take place.

From the hernia humeralis, this species of hydrocele is easily distinguished. In the former, the tumor succeeds either immediately to some external bruise, or it is evidently the consequence of a gonorrhœa, or of some other inflammatory affection of the urethra *. The skin is more or less affected with an inflammatory redness ; it is attended with much pain, especially on being handled, and the tumor is hard and firm, so that no fluctuation is

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felt

* The operation of lithotomy is frequently attended with an inflammation of one, and sometimes of both testicles ; probably from the inflammation induced by the operation in the neighbourhood of the caput gallinaginis, being communicated along the vas deferens to the testes.

felt in it, unless in its more advanced state, when suppuration sometimes, although rarely, takes place between the scrotum and testicle; in which case, the usual symptoms of abscess, particularly the pointing of the tumor, and its being much discoloured, serve to distinguish it.

In forming a prognosis of this disease, we should be chiefly directed by the habit of body of the patient. In a great proportion of cases we are to consider it as a local affection; and, in this state the most favourable expectations may be formed of it. For, whatever may have been alleged by some, of the hazard of every operation for a radical cure, in a simple unmixed hydrocele, if the constitution is not very unhealthy, it may at all times be advised with a very fair prospect of success.

In the radical cure of the hydrocele, in whatever way it is done, some pain will be excited; the parts will inflame, and of course some degree of fever will take place.

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In some instances, these symptoms have gone rather farther than was wished for; but, under the limitations I have mentioned, of an unmixed state of the disease, in a constitution otherwise healthy, the operation I shall presently describe, when properly performed, and the cure thereafter rightly conducted, never fails of the most complete success, while, in no instance, has it ever, in the course of my experience, proved fatal.

But, on the contrary, in constitutions otherwise diseased, in very aged people, and in infirm habits of body, we are by no means to expect such certain success: Even in such circumstances, however, the operation often succeeds. I have, in various instances, performed it under one or other of these disadvantages, and I never knew it fail. Others, however, have found that it has done so; and it may readily be supposed, when practised upon the old, infirm, and diseased, that the symptomatic fever may run too high for the strength of the patient; and that the suppuration

produced by a high degree of inflammation, may afterwards tend to destroy the remains of a constitution already greatly impaired. This, however, should not be laid to the account of the operation, but to the impropriety on the part of surgeons, in advising it in patients already perhaps in danger with other diseases. In such circumstances, no operation should be performed, and the patient should be desired to trust entirely to a proper use of a suspensory bandage.

In judging therefore of the event of a hydrocele, I would say, that in constitutions such as the operation should be advised in, scarcely any danger is to be dreaded; while, on the contrary, in the infirm, and especially in such as are otherwise unhealthy, that some risk will occur from any operation we can propose, and that the degree of risk will be nearly in proportion to the nature and extent of that disease with which the constitution is affected.

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As long as a hydrocele keeps within moderate limits, patients, in general, rather submit to the inconvenience than undergo the pain of an operation; at least this is commonly the case with people of rank, who can more readily submit to any distress which it excites, than patients of a poorer class, whose labour is frequently impeded by the size of the tumor. At last, however, by its bulk, it excites in all a strong desire to have it removed; for, besides the desire naturally implanted in all mankind, to be sound and entire in these parts, the water collected in a hydrocele, is, in some instances, so very considerable, as to be the cause of much inconvenience. When, from timidity, or any other cause, the operation has been too long delayed, I have known the tumor become so large, as in course of time to cover a considerable part of each thigh, and in length to extend from the groin to the knee.

Various methods have been proposed for the cure of hydrocele; all of which, however, may be reduced to two: Such as

have in view only a temporary relief, and which is therefore termed the palliative cure; and such as are meant to effect a radical cure, or a final removal of the disease.

Whatever advantages may be experienced from the use of internal medicines, in dropfy of the constitution, no practitioner, I believe, has so much confidence in remedies of this class, as to expect much advantage from them in encysted dropfy of any kind. We have daily proofs of their failure in partial hydropic collections, wherever they are seated; and in none more frequently than in the hydrocele.

We are told, indeed, of this disease being cured by different medicines, particularly by the use of drastic purgatives; but, although I have often known them employed, it was never with any advantage, and, when pushed to any extent, they are sure to do harm. As it is always proper, however, to confine the patient to bed for some time after any operation of importance,

ance, in order to prevent him from being afterwards disturbed, his bowels should be emptied by a purge immediately before any operation for the radical cure of a hydrocele is performed; but this is almost the only way in which purgatives can here prove useful. Internal medicines, therefore, being found ineffectual, and we know of no external applications to be depended upon, we are to seek for that relief from surgery which experience shows it never fails to afford.

When the tumor in the scrotum has become so large as to be inconvenient from its size, if the patient either refuses to submit to the operation for a radical cure, or if his state of health renders that operation improper, in such circumstances, the palliative treatment, or a mere evacuation of the water by puncture, is the only means we can employ.

Two methods are proposed for drawing off the water in this manner; by the puncture of a lancet, and piercing with a trocar. By some it is alleged, that by the puncture
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of a lancet the water can neither be so completely or so properly drawn off as with a trocar; for the orifice in the skin being apt to recede from the opening in the tunica vaginalis, the water is thereby either stopt altogether, or is apt to insinuate into the surrounding parts. By others again, it is said, that the difficulty of introducing the trocar is such as to render it hazardous from the contiguity of the testicle; and instances are not wanting to show, that, even in the hands of expert surgeons, the testis has been much injured by a trocar reaching it in this operation. Indeed the ordinary triangular form of this instrument makes it both difficult and unsafe to introduce it; but the trocar, of a flat form, an improvement which I proposed a good many years ago, enters with as much ease as a lancet. This instrument is represented in Plate LIX. fig. 4.; and in Plate LVIII. fig. 2. another form of the trocar is delineated, with either of which, an opening may be made in the tunica vaginalis with perfect safety, and the

the water with this instrument being much more freely drawn off than with a lancet, by which effusions are often produced into the cellular substance of the scrotum, the use of a lancet for this purpose should therefore be laid aside.

The instrument being fixed on, the next point of importance is the part of the tumor in which the puncture should be made. Even in this simple operation, an acquaintance with the anatomy of the parts proves useful. The testes, as I have endeavoured to show, do not hang loose in their vaginal coats ; being, on the contrary, firmly attached to them behind. Hence at this part, even in the largest hydrocele, no fluid is met with ; so that if, through ignorance or inattention, the trocar should be inserted here, one instance of which I have seen, the instrument would pierce the body of the testis, while it would not lessen the tumor, as it would not reach the cavity of the vaginal coat in which the fluid is collected. The trocar should be introduced
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in the anterior and most depending part of the tumor.

The patient being seated in a chair, or on a table, with the scrotum hanging over the edge of it, the operator, with his left hand, should grasp the tumor behind, in such a manner as to push the contained fluid as much as possible into the anterior and under part of it. This being done, if a common round trocar is used, a small opening about a quarter of an inch in length should be made through the skin, with the shoulder of a lancet, on that point where the trocar is to enter; but with a flat trocar this precaution of previously dividing the skin is unnecessary. The operator now takes the trocar in his right hand, and having fixed the head of it in the palm of his hand, he places the forefinger along the course of it, leaving as much of the point of the instrument uncovered as may freely penetrate the tunica vaginalis; and this being pushed in, the stilette should be withdrawn immediately on the end of the canula having entered the cyst. The
water

water will now run off; and, if the tumor is not uncommonly large, it may be all drawn off at once; but when the swelling is large, as the sudden discharge of the fluid, by taking away too quickly the support which it gave to the vessels of the testis and vaginal coat, might endanger the rupture of some of them, it is better from time to time to stop the flow of it for a few seconds; and when the whole is thus evacuated, and the canula withdrawn, a piece of adhesive plaster should be immediately applied to the orifice; and a compress of soft linen being laid over the scrotum, the whole should be firmly supported, either with a well-adapted suspensory, or a proper application of the T bandage*.

The patient being in this state laid in bed, all kind of uneasiness is, in a few minutes, commonly gone, and he goes about

* Some very judicious remarks, on the importance of a due compression in such cases, may be met with in remarks upon this subject, in the works of the late Dr *Monro*.

about his ordinary business without interruption. In a few instances, however, it has happened, either from the external air finding access to the testicle, or from the sore produced by the trocar becoming inflamed, that the whole body of the testicle has been seized with inflammation, by which a radical cure of the disease has been obtained. This, however, is a rare occurrence, and hardly to be looked for.

About four years ago, the public was favoured with some observations on this disease by Mr Keate of London, in which some cases are related of hydrocele being cured by the external use of a stimulating application, a strong solution of sal ammoniac in vinegar and spirit of wine. The following is the formula employed by Mr Keate.

R \acute{x} . Sal. ammoniac. in pulv. trit. $\frac{3}{4}$ i.

Acet. spirit. vin. rect. sing. $\frac{3}{4}$ iv.

A quantity of soft old linen, well moistened in this, is desired to be folded round
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the scrotum, to be supported with a suspensory bag, and renewed three times a day: But, although I have given this method a fair trial in upwards of twenty cases, in some while the cyst remained distended, and in others immediately after the water was drawn off, I have not been so fortunate as to succeed. In some, the application of different stimulants and astringents after the operation of tapping, has appeared to prevent the collection from returning so quickly as it otherwise might have done; but even this has not been frequent, and in no instance, in the course of my observation, has it produced a cure.

With the same view, I have employed a variety of stimulants and astringents, such as volatile liniment, prepared with six parts of oil, one of camphor, and one of spirit of hartshorn; tincture of cantharides; the steams of vinegar; poultices of vinegar and crumb of bread; and compresses of linen, soaked in brandy: and the practice being neither attended
with

with difficulty or hazard, I mean to continue it till farther experience shows, whether it should be retained or not. That it will often prove successful in removing a hydrocele, by promoting the absorption of the fluid contained in the tunica vaginalis, is scarcely to be expected; but we may reasonably suppose, that stimulating applications, capable of exciting inflammation in the testes, may accomplish a cure, after the water has been drawn off with a trocar.

Drawing off the water with a trocar is an operation easily performed, and it very seldom does harm; but when not done with caution, especially when the patient is allowed to walk or ride soon after the water is taken away, it sometimes ends in very troublesome symptoms. If the habit of body is bad, this will happen with whatever attention it may be done. Of this every practitioner may have met with instances; and two are related by Mr Pott, one of which terminated fatally, and gangrene ensued in the other, which,

which, in a few days, destroyed not only a good deal of the scrotum, but even a considerable portion of the tunica vaginalis *. Both of these, indeed, occurred in very unhealthy constitutions ; but it is proper to have it known, that even this operation may, in certain habits of body, be productive of very distressful consequences.

Drawing the water off in this manner, in order to give relief from the bulk and weight which it produced, would probably be the first idea that occurred to practitioners in the treatment of hydrocele ; but being found inadequate to the complete removal of the disease, various other methods were afterwards introduced. The actual cautery, and the ligature, were both proposed as means of preventing farther descents of water from the abdomen, which, in former times, was considered as the origin of this disease. Celsus advises the cyst of a hydrocele to be cut away, and many of his followers do the same. Tents,

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* Cases xxi. and xxii. Treatise on the Hydrocele.

both solid and hollow, were afterwards employed ; as was likewise the use of the seton, which we find recommended by Fabricius ab Aquapendente, and other writers, even of a more early period. Various applications, of the caustic kind, have at different times been in vogue : Injecting wine, diluted ardent spirits, and other irritating liquids, into an opening in the vaginal coat, has been proposed, as a means of inducing a degree of inflammation sufficient for affecting a radical cure ; and a simple incision of the cyst containing the water, has been practised for the same purpose. These are the means which, at different periods, have been employed for the cure of hydrocele. Ancient practitioners seem to have been acquainted with all of them ; but having very inaccurate ideas of the anatomy of the parts concerned, they could not have any fixed or clear opinion of the manner in which any of their remedies acted in effecting a cure. In consequence of this, they were applied at random ; and none of them proving in
general

general successful, the ignorance they laboured under in the theory of the disease, made them frequently propose varieties in the method of cure.

The moderns possess one important advantage over the ancients, from knowing that the water in hydrocele is contained in a particular cyst having no immediate communication with any other part or cavity of the body, and from finding that this disease resembles, in many respects, other encysted tumors, with the means of curing which they are well acquainted.

Both in encysted tumors and hydrocele, the contents of the swelling are secluded from the external air. Neither of them have any communication with any other part of the body; and, although the bag containing the matter of an encysted tumor, is, in some measure, a new formation, yet, in many instances, it is found to be equally firm and elastic with the tunica vaginalis testis.

In the treatment of encysted tumors, practitioners are now agreed, that, besides

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evacuating

evacuating the matter, means must be employed for destroying the cavity which contained it, otherwise it will collect again. To accomplish this, different methods have been proposed; some with a view to destroy entirely the cyst which contained the matter, and others, as it is said, to fill up the cavity, by a formation of new parts.

But we know, that unless the coats of a cyst are much extended, hard, or greatly thickened indeed, no part of it should be removed. It is also known, that to fill up the cavities of tumors with a formation of new parts, is a mere imaginary thing, being what neither nature or art can do to any extent; and we likewise know, that the cavity of every tumor may be more effectually destroyed by producing an adhesion of its sides, than by any other means.

Parts of the human body, in a state of inflammation, very readily adhere together. So easily indeed do they do so, that some art is required to prevent the
adhesion

adhesion of contiguous inflamed parts, of which every practitioner must have met with examples. Hence, abscesses and encysted tumors are more easily cured by exciting inflammation over their internal surfaces, after their contents are evacuated, than by any other means; and, in like manner, it is now known, that the hydrocele of the tunica vaginalis may be treated upon the same principles, and with the same general effects.

This is the most simple idea that can be given of the practice that should be kept in view in the cure of hydrocele; and I hope it will serve to render it clear and intelligible.

The intention, then, of every means now in use for the radical cure of this species of hydrocele, is, to induce such a degree of inflammation on the parts in which it is seated, as may tend to obliterate entirely the cavity of the tunica vaginalis, by making it adhere firmly to the tunica albuginea, the surface of the testicle.

Some individuals, indeed, still proceed upon the supposition of a total destruction of the sac being necessary for a complete cure; but extensive experience now makes it evident that this is not the case. When the sac has become unusually thick or hard, it proves sometimes useful to remove those parts of it that are particularly diseased; and when it has been distended to such a degree as entirely to have lost its tone, removing a part of it may forward the cure, by allowing the scrotum to contract more readily; but it happens so seldom from any of these causes, that I have only met with a very few instances, in which it appeared necessary to remove any part of it. A cure may indeed be obtained of this variety of hydrocele, by removing the sac entirely; for the contiguous parts from which it is cut away, readily adhere together, so as to destroy the cavity in which the fluid was contained; but what I wish to have understood, is, that we are not to consider it as necessary, as the same end
may

may be obtained by much more lenient measures.

I shall now proceed to speak more particularly of the several means at present most frequently employed by practitioners for effecting a cure, and shall treat most minutely of those now in general use. These are, excision of the tunica vaginalis; the application of caustic; the use of a seton; a simple incision of the sac; and injecting wine and other acrid liquors into the tunica vaginalis, after drawing off the fluid which it contained.

The method of cure, by removing the vaginal coat, which was well known to the ancients, had nearly fallen into disuse, when it was revived by the late Mr Douglas of London; and by a few practitioners it is still continued. The method of doing it is, first to dissect out an oval piece of the scrotum, which Mr Douglas considers as always necessary; and having then laid the vaginal coat open, to cut it away by different snips with scissors. But, whoever may continue to think fa-

vourably of the excision of the sac, will find, that it may be more easily done with a scalpel than with scissars; and it can seldom or never be necessary to remove any portion of the scrotum.

As much danger might ensue from the incision being carried too near to the testicle, all the posterior part of the sac, or that part of it by which the testicle is connected to the scrotum, should be allowed to remain. On the sac being removed, the parts must be dressed, and treated in every other respect in the same manner as in the operation with the simple incision to be hereafter described.

The cure by caustic has commonly been conducted as follows: The scrotum being shaved, a piece of common paste caustic, properly secured with adhesive plaster, is applied, of about a finger's breadth, the whole length of the tumor; and if, on removing the caustic, it has not penetrated the tunica vaginalis, an opening is made in it with a scalpel, so as to evacuate
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ate the contents, lay bare the testicle, and admit of proper dressings.

But Mr Else, one of the latest writers in favour of the method of cure by caustic, says, that there is no necessity for such an extensive application of caustic as many have recommended ; that an eschar, of the size of a shilling, is sufficient ; that this may be always fully obtained by the application of caustic paste, of the size of a fixpence, which he directs to be laid upon the anterior and under point of the scrotum, and to be properly secured by adhesive plaster, in order to prevent it from spreading*.

The caustic commonly produces all its effects in the space of five or six hours, and may then be removed. At this time, digestives, or an emollient poultice, must be applied over the scrotum ; and the whole properly suspended with a bandage.

Inflammation, Mr Else observes, is soon induced over the whole tunica vaginalis ; and the febrile symptoms that succeed, he
advises

* Vide An Essay on the cure of the hydrocele of the tunica vaginalis testis, by Mr Else, 2d edit. p. 33.

advise to be kept moderate by blood-letting, injections, emollient poultices, and a low regimen. In a few days, the eschar of the scrotum separates, and comes away; and, in a gradual manner, in the course of four, five, or six weeks, the whole tunica vaginalis comes off, when the wound, for the most part, soon heals, and a complete cure is obtained.

In the cure of the hydrocele by the seton, the following is the method of applying it, as advised by the late Mr Pott, who wrote a full and ingenious treatise on the subject: He used a trocar; a silver canula, five inches in length, and of such a diameter as to pass easily through the canula of the trocar; and a probe, six inches and a half long, having, at one end, a fine steel trocar-point, and at the other, an eye, which carries a cord of coarse white sewing silk, of such thickness as to pass easily through the long canula. With the trocar the inferior and anterior point of the tumor is to be pierced; and, as soon as the perforator is withdrawn,

withdrawn, and the water discharged, the seton canula is passed through that of the trocar, till it reaches the upper part of the tunica vaginalis, and is felt in the superior part of the scrotum. This being done, the probe, armed with its seton, is to be conveyed through the latter canula, the vaginal coat and teguments to be pierced with the point of it, and the seton to be drawn through the canula, till a sufficient quantity is brought out at the upper orifice, when both canulas are to be withdrawn, and the operation is finished.

About the end of the third day, the parts begin to inflame; when fomentations, poultices, a suspensory bandage, a temperate regimen, and a lax belly, are ordered, to keep the symptoms moderate. As soon as the parts become easy, by the inflammation lessening, which is generally about the tenth or twelfth day, the seton is begun to be diminished, when six or eight threads are withdrawn at every dressing; the dressing, consisting of nothing more than a superficial pledget on each orifice, and

and a discutient cerate, such as the ceratum saturninum, to cover the scrotum.

In the treatment of the hydrocele with a seton, I should wish to follow Mr Pott's method, in every circumstance but the mode of introducing it, which is rendered unnecessarily complex, by the number of instruments proposed for it. In Chapter I., I have described the manner of opening abscesses with a seton, and the directions then given prove equally applicable here.

Let an opening be made with a scalpel, a large lancet, or sharp-pointed bistoury, in the superior part of the tumor, large enough to admit, with ease, a cord, consisting of about thirty threads of common white sewing silk. A director, with an eye at one end, Plate LXVII. fig. 3. in which the cord is inserted, is to be introduced at this opening; and its farther extremity being carried down to the most depending part of the tumor, an opening is there to be made, half an inch in length, by cutting on the director with the bistoury.

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The director being now drawn down till a sufficient quantity of silk is left hanging out below, the operation is in this manner finished. In every other respect, the management of the seton should be the same with the method described above from Mr Pott ; or, instead of introducing the cord with a director, it may be done with a silver canula and perforator, represented in Plate LXVII. fig. 1. 2. and 4.

By making the first opening in the upper part of the tumor, the instrument conducting the seton is more easily introduced along the course of it, than when the first opening is made below ; for, in this case, the tumor remains distended to the last : whereas, when opened below, the contents rush out immediately ; and the vaginal coat collapses so much about the testicle, that I have known it difficult to get the instrument insinuated between them, by which the testis has, in different instances, been injured ; and, by making the under opening half an inch long, any matter which forms in the course of the
cure

cure is easily and readily discharged : whereas, in Mr Pott's method of operating, where the opening is not larger than the size of the trocar, as this is completely filled by the cord, the matter is thereby allowed to collect ; an incision becomes necessary, to discharge it ; and thus the patient is exposed to pain and disappointment, as I have seen in various instances, where the precaution I have mentioned has been omitted, of making the opening at the most depending part of the tumor sufficiently large for discharging any matter that may form.

Before entering farther into the consideration of the method of cure by the scrotum, I shall proceed to describe the operation for a radical cure, by incision.

The patient being laid upon a table of convenient height, and properly secured by assistants, with the scrotum lying nearly on the edge of the table, the operator, with one hand, should grasp the tumor behind, so as to hold it firm, and make it somewhat tense on the anterior part of it :

it: With a round-edged scalpel in the other, he should now divide the external teguments by one continued incision from the upper end of the tumor, all along its anterior surface, down to the most depending point of it.

If the incision has been properly made, the divided scrotum will retract, and the tunica vaginalis will be laid bare, for the breadth of about half an inch over its whole length. An opening is now to be made in the vaginal coat, just at the upper end of the tumor, where the first incision commenced, and it may be done either with a lancet, or sharp-pointed bistoury, or a scalpel. This opening should be of such a size, as freely to receive the finger of the operator; which, being inserted, a probe-pointed bistoury is to be conducted upon it, and the sac divided to the very bottom, directly in the course of the first incision. By the previous division, of the skin, with the scalpel instead of the bistoury, the operation is done with more accuracy, and less pain; for the scalpel,
from

cient. But the difference of pain between incisions of these different lengths is inconsiderable, and not to be regarded when compared with the effects that result from them. When the incision is carried the full length of the tumor, the operation succeeds in every instance, if the subsequent part of the treatment meets with due attention ; whereas I have known various instances of these partial openings being followed with a return of the disease.

It is particularly proper to carry the incision of the tunica vaginalis, down to the most depending point of the tumor ; otherwise the contents of the sac will not be completely discharged, while room will be given for collections of matter during the cure. It is also proper to remark, that, in making this incision of the sac, it ought to terminate at some distance from the testis ; for I have, in different instances, observed, where the vaginal coat has been cut near to the testicle, that the inflammation was particularly severe.

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The incision being completed, the testicle covered with its tunica albugina, is brought fully in view. In some instances, the testis protrudes from the surrounding parts; in which case, it should be immediately replaced, and covered as quickly as possible from the air; and if no part of the tunica vaginalis is to be removed, the dressing may be finished directly on the sac being opened.

Unless the sac is diseased, or so much distended as entirely to have lost its tone, no part of it, as I have observed above, should be removed: but when hardened to the firmness of cartilage, as I have more than once seen, as, in this state, it is apt to excite pain when applied to the tender surface of the testis, it ought undoubtedly to be removed; and as, in this state, it commonly separates with ease from the surrounding cellular substance, it is easily and quickly cut away with a scalpel or bistoury. The removal of any portion of the sac from the mere enlargement of the

tumor, can seldom be necessary ; not once in fifty instances.

Hitherto I have been supposing that the disease is confined to one side of the scrotum ; but, in some instances, as I have remarked above, we meet with a hydrocele in both sides at once. In this case, the common practice is, to do the operation twice in all its parts, both in the scrotum and tunica vaginalis, by laying each collection open, from top to bottom, by a double incision. Some advise both operations to be done at the same time ; but, in general, practitioners are afraid of too much inflammation being induced by this ; so that one side is commonly allowed to heal before the other is opened. In this manner, the patient is exposed to delay, uncertainty, and to the confinement arising from two operations.

This, however, is not necessary, as the operation may be done on both sides at once, with little more pain, and, so far as I have seen, with no more hazard, than in the usual method of doing them separately.

ly. The method in which I have done it is this :

After finishing the operation on one side, an opening is made into the vaginal coat of the opposite testicle, at the upper end of it, through the septum scroti ; and the incision being carried down to the bottom of the tumor, the cyst is thus equally well laid open, the serum is as completely discharged, and the disease is not more liable to return, than by doing the operation in the usual manner, and at different times.

Whether the hydrocele is double, or confined to one side, as soon as the incision is finished, if the testis is found, the wound should be quickly dressed ; and, I think it right to observe, that, on the manner in which this is done, much of the success of the operation at all times depends, more indeed than is commonly imagined.

If the vaginal coat is merely wrapped about the testicle, without the interposition of dressings, or, if the divided sides

of it are immediately united with futures, as some have advised, partial adhesions are apt to take place, before a degree of inflammation is produced over the whole, sufficient for rendering the cure complete. In this manner, cavities are left, which either fill with pus during the cure, and require to be laid open, or they afterwards give rise to collections of serum, and thus occasion a return of the disease, different instances of which have fallen within my observation. And, again, the practice of stuffing the cavity of the scrotum with dressings, is also a frequent cause of mischief. By rubbing, or pressing upon the surface of the testis, such a degree of inflammation is sometimes induced, as excites much pain, inflammation, and fever. But this is almost always the fault of the operator; for, in a great proportion of cases, if the dressings are properly managed, no violent symptoms ever occur.

After having tried various ways of dressing the parts, the method I have now long pursued, and which in no instance I have found

found to fail, is this: The testicle being properly placed in the newly divided sac, two pieces of soft old linen, exactly the length of the cut, previously dipped in a liniment of wax and oil, are, by the help of a probe, inserted to the bottom of the sac, one on each side of the testicle, between it and the vaginal coat, care being taken to leave a sufficient quantity of each pledget hanging out of the wound, to admit of its being easily withdrawn at the first dressing; otherwise, if the swelling, which afterwards takes place, shall be considerable, they may, for some days, be entirely covered, and even at last removed with difficulty, as I have seen in different instances where this piece of attention has been omitted.

If the testicle has pushed forward, and is with difficulty retained in its situation, as it will be apt to slip out between the lips of the wound between one dressing and another, no means should be omitted that can, with safety, be employed for preventing it, as it cannot afterwards be

so easily replaced; and, from want of attention to this, I have known the testicle entirely extruded from the scrotum, and, in one instance, from sufficient pains not being taken to replace it, the cure was completed with the testis in this situation; when, instead of being covered with the vaginal coat and scrotum, it was covered with scarf-skin only.

The best method of preventing such a misfortune, is, to draw the edges of the divided tunica vaginalis and scrotum nearly together, after the testis has been properly placed, and the pledgets of oiled linen inserted; and, in this situation, to secure them, either with two or three sutures, at proper distances from each other, or with slips of plaster, sufficiently adhesive for retaining them.

This being done, the whole scrotum is covered with a large pledget of saturnine cerate, or common wax ointment, by which the parts are kept much more soft and easy, than when dressed, in the usual way, with dry lint, at the same time that
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the dressings are much more easily removed. A cushion of soft tow, with a proper compress, is placed over the pledget of ointment, and the whole are retained by the T bandage, or common suspensory bag. The patient is now carried to bed: A quieting draught should be given; and he should be enjoined to remain as much as possible in the same posture; for much motion at this period certainly does harm.

The intention of this operation being to induce a moderate degree of inflammation in the tunica vaginalis and surface of the testicle, if the pain, inflammation, and swelling, which, in some degree, always succeed, do not run to a great height, nothing is to be done for the first two or three days after the operation; but, when these symptoms become violent, and especially when much fever is induced, means must be employed to lessen or remove them.

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tices and fomentations to the part, in order to forward a plentiful suppuration, which commonly tends to moderate every bad symptom more effectually than any other remedy. By these means, the inflammation is in general easily kept within proper bounds; but where the mode of dressing I have pointed out is adopted, they are not often required. In a great number of cases, in which I have done the operation in this manner, I have only once found it necessary to advise blood-letting, and very rarely fomentations or poultices.

In most cases, the inflammation of the testicle does not rise higher than in the simple hernia humoralis from gonorrhœa; and it gradually subsides as the suppuration advances. The abatement of the inflammation is also assisted by continuing a cool diet, the occasional use of opiates, and keeping the belly open.

Often in two days, and always by the end of the third, I remove all the dressings, except the pledgets inserted between
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the testis and tunica vaginalis. This is one important advantage we derive from covering large sores with pledgets of ointment. The dressings are easily removed at any period ; so that, without waiting for a plentiful suppuration, as is commonly done, the patient may, at any time, be relieved from that distressful uneasiness, of which all those complain, in whom the first dressings are several days in being taken away. They are always rendered stiff and uncomfortable, by the blood discharged upon them after the operation ; and the matter at first secreted being thin and acrid, I have, in various instances, seen, when the dressings have not been removed for six or seven days, and in some cases even in less, that the whole contiguous parts have been excoriated by the acrimony of the matter alone, and by which more uneasiness has been induced during the course of the cure, than by any other circumstance connected with the operation : Nay, in some, the inflammation induced in this manner has an obvious influence

fluence on that of the testicle, and tends to render it much more severe than it otherwise would be.

On some occasions, at the first dressing, and always at the second or third, the pledgets inserted between the tunica vaginalis and testicle come away ; and whenever this happens, they should be renewed. It is also proper to renew them daily, for the first fourteen or fifteen days after the operation ; not, however, of the same depth as the first, as, during the latter part of the cure, it proves sufficient, if they are merely inserted so far as to prevent the divided edges of the tunica vaginalis from adhering to the testicle before the adhesive process has taken place in the parts more deeply seated. To this point, I must observe, the most particular attention is necessary ; for, when this mode of operating fails, that is, when the disease returns, it is, almost in every instance, from this precaution being overlooked. In my own practice, the disease has not returned in a single instance : But I have
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met with different cases in which it has done so, and in all of them from the cause I have mentioned, to wit, the divided edges of the tunica vaginalis being allowed to adhere to the testicle, before adhesion had taken place between the parts more deeply seated.

In almost every circumstance, the treatment of hydrocele by this operation is the same with what answers best in a common abscess. After opening an abscess, if the lips of the newly-divided parts are allowed too early to adhere, either to each other, or to the parts beneath, the operation will most probably fall to be renewed, as matter will thus be allowed to collect, by which the patient will be nearly in the same situation as before; while all manner of risk of this is prevented, by the cut being kept open till the sides of the abscess adhere to each other. In like manner, we never fail in the cure of hydrocele, if the external cut is kept open, not till the cavity of the tunic vaginalis fills up with granulations, as some have
imagined

imagined to be necessary in this mode of operating, but merely till such a degree of inflammation is induced upon the testicle and vaginal coat, as terminates in their adhesion to each other.

This idea of the whole cavity of parts in this situation being to fill with new granulations, has been held out by some as an objection to this operation; and as many believe that it actually happens, I have judged it proper to speak of it more particularly than those will consider as necessary, who have been accustomed to operate in this manner. No such process takes place: instead of it, the testicle and vaginal coat, soon after the operation, become inflamed; till the sixth or seventh day, the inflammation continues gradually to increase, when the whole tumor, as I have observed above, has acquired the usual size and appearance of a common hernia humoralis from gonorrhœa. About this period, the tunica vaginalis is found to adhere to the testis, over all the posterior and lateral parts of the tumor, and on the
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the flaps of oiled linen being gradually lessened, and at last withdrawn, by the fourteenth or fifteenth day, or soon thereafter, the adhesion becomes complete; the tumor of the testis gradually subsides, and the fore produced by the cut, and now reduced to a line, heals in a shorter or longer time, according to the habit of body, age, and other circumstances of the patient. In some, the cure is complete in three weeks; I have known it in less; while, in others, it runs on to the fourth, fifth, and, in a few cases, to the sixth week.

Having thus given an account of the different operations usually employed for the radical cure of the hydrocele, I shall now make a few observations on the comparative advantages of the three last, to wit, those by caustic, the seton, and the simple incision; one or other of these being now commonly practised for the removal of this disease.

From the testimony of many respectable authors of the efficacy of each of these,

these, there is no reason to doubt that any of them would, in most instances, prove effectual: that the caustic, when properly managed, will, for the most part succeed, we have every reason to believe; and the same may be safely asserted both of the seton, and the simple incision; but every practitioner being apt to be prejudiced in favour of a particular method, he generally continues to practise that mode, and no other; and finding that it commonly succeeds, he by degrees comes to persuade himself, that other methods of cure, with which he has not had such opportunities of becoming acquainted, are liable to objections, which those who have practised them do not find to be the case.

I happened to attend the hospitals in London, about the time that Mr Pott's publication on the seton, and Mr Elfe's treatise on the cure of the hydrocele by caustic, were published; when, of course, the various means of curing the disease were frequently the subject of medical conversation. I was thereby induced to

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pay much attention to the subject; and having the advantage of seeing the practice of different hospitals, and not being particularly biassed in favours of any particular method, I was thus furnished with the best opportunity that could be wished for of forming an opinion: And the result of all the observation I was either at that time able to make, or since that period, both in the hospital here, and in private practice, is, that although all the three modes of operating, by caustic, the seton, and simple incision, are perhaps equally capable of producing a radical cure; yet that, of the three, the latter, to wit, the mode by the simple incision, is liable to fewest objections, and effects a cure both with least trouble to the operator, and least risk to the patient: And, of the other two, the treatment by caustic appears to me to be the best.

I have seen all the three produce troublesome symptoms, such as, pain, and tension of the abdomen, inflammation, and fever; but, from much observation, I can,

without hesitation, say, that the seton is more frequently productive of these than either of the others ; nor need we wonder at this being the case ; for the cord which is here introduced, lying in close contact with the body of the testis, must necessarily occasion a considerable and continued irritation, as long as it remains applied to it.

The seton is likewise attended with other inconveniencies, to which neither of the others, when properly managed, are liable. When the inflammation, which succeeds to the introduction of the cord, runs high, as it frequently does, it commonly terminates in such a plentiful supuration, that the matter produced by it cannot be readily discharged at the opening made for the seton. In consequence of this, it finds access to the neighbouring parts ; and different abscesses are accordingly formed, which must all be discharged by as many openings. This may, in part, be obviated, by making the inferior opening of the size I have directed ;
but,

but, in some instances, I have found even that this has not proved sufficient, owing to the opening being reduced in size by the swelling and inflammation of the tumor.

Another objection to this operation, which I think of importance, is this: It does not admit of free examination, either of the state of the testicle, or of the fluid contained in the sac. I know that, in a simple uncomplicated hydrocele, the state of the testicle requires no examination; nor would we think of removing it, either on account of a mere enlargement, or diminution of its size, provided it is not otherwise diseased. But we know well, that cases sometimes occur, which elude the utmost skill and penetration of the surgeon; no diagnostic symptoms, with which we are yet acquainted, being sufficient to direct us with absolute certainty.

The most experienced practitioner will admit, that, at times, he has been mistaken in his opinion respecting the nature

of such tumors ; a real sarcocoele, or scirrhous testicle, attended with some effusion of a fluid, being, in some instances, mistaken for a pure unmixed hydrocele ; and, vice versâ, a simple uncomplicated case of hydrocele has been mistaken for, and treated as a scirrhous testicle. Such occurrences every practitioner must have met with ; and, among others, who confess their having been deceived in this manner, a very candid acknowledgment is made of it by Mr Pott * ; and Mr Else takes notice of a similar occurrence in which he was concerned.

I have been concerned in different cases, where the most experienced surgeons were
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* *Treatise on the Hydrocele*, p. 288. In this case, which, from every circumstance, had been considered as a sarcocoele, the testis, after being removed, was found to be perfectly sound, the disease being a real hydrocele of the tunica vaginalis.

The mere possibility of such an occurrence with such an attentive observer as Mr Pott, ought to serve as a most convincing argument with practitioners of the necessity of proceeding with the utmost caution in all such cases, where there is the least cause for doubt.

at a loss to determine the real nature of the disease ; that is, whether the swelling in the scrotum was a simple hydrocele of the vaginal coat, or an effusion of a fluid into that bag produced by a scirrhus testicle. In all such cases of doubt, the surgeon should proceed as if the tumor was a real sarcocele. If, on laying open the swelling, the testicle is found diseased, that is, if it is in such a state as to require extirpation, it should be removed immediately ; while, on the contrary, if it appears to be sound, he will treat it as a case of simple hydrocele.

In several instances of this kind, where, by different practitioners, a mere collection of water was expected without any other affection, the testicle has been found to be so much diseased, as to render immediate extirpation proper. Now, if in such circumstances a cure had been attempted by the seton, the testicle would have been allowed to remain exposed to the irritation produced by the cord, which probably would have induced very trouble-

some and even alarming symptoms ; for we know that every symptom of a scirrous tumor, is uniformly rendered worse by irritation.

It has indeed been alleged, that the real state of the testis may be always known, by drawing the water off from the tunica vaginalis with a trocar ; and this has accordingly been recommended as a previous step to the introduction of the seton, with a view to ascertain the state of the testicle. But it often happens, even after all the water is drawn off, that the thickness produced by the vaginal coat and scrotum collapsing in large folds about the testis, precludes effectually every accurate examination of this kind. Of this, where the tumor has been large, every practitioner must have met with instances ; and we need not be surpris'd at its being so, when it is known that instances occur, in which it requires a good deal of experience to determine, whether a testicle is so much diseas'd as to require extirpation, even when completely laid bare in the
common

common operation for the hydrocele. Of this I have known several cases in which a difference of opinion occurred, even among surgeons of observation; and among these, the most remarkable happened in an operation performed by a late very eminent surgeon. The case was supposed to be a scirrhous testicle connected with the effusion of a considerable quantity of a fluid into the tunica vaginalis. On laying open the tumor, the testicle was found enlarged and hard; but being neither painful nor unequal on the surface, the operator thought it improper to remove it: The surgeons present were of a different opinion; but the event of the case, which was favourable, tended to evince the superior judgment of the operator, although, previous to the operation, he had entertained a very different opinion.

I have also observed above, that when the seton is used, the contents of the cyst cannot be properly ascertained. It sometimes happens, as will be more particular-

ly noticed in the next section, that a portion of gut is contained in the upper part of a hydrocele. Of this I have met with several cases, in some of which no suspicion was entertained of it, till the sac was laid open, although in two of them the water had previously been drawn off with a trocar.

In other instances, the water of a hydrocele is contained in hydatids *; a circumstance not to be discovered previous to the opening of the tumor: And as it will be readily admitted that the method of cure by seton is ill suited for discharging hydatids, this of itself is a material objection to the practice; so that, although the seton, in every other respect were equally eligible with the simple incision, which, for the reasons formerly given, I think it is not, yet the three last objections that I have adduced against it, seem

* Those who doubt of the existence of hydatids in cases of hydrocele, as some have done, will find different instances of them recorded in Morgagni de *Causis et Sedibus Morborum*.

seem to be sufficient reasons for setting it aside.

With respect to the mode of treatment with caustic, I have only to observe, in addition to what has already been said of it, that where patients are naturally timid, and do not incline to submit to the operation by the knife, this may be put in practice.

But the method of cure by caustic is liable to one important objection, which never attends the cure by incision, to wit, that of being productive of sinuses, and collections of matter, in the scrotum and cellular substance connecting that bag to the tunica vaginalis. Two instances of this I have seen, in which it was necessary to discharge collections of matter by different openings; and a remarkable case of it is related by Douglas, in which an extensive incision became necessary for removing the collected matter*. For this reason, therefore, and as the method of cure by incision brings the state of the testicle

* P. 105.

testicle immediately and more completely into view, and especially as, from all the experience I have had of the two different modes of operating, that by incision seems to produce the least troublesome symptoms, I am decidedly of opinion that it should be preferred.

In points of such importance, no person should form any opinion hastily. Nothing but various opportunities of putting the different operations in practice, can enable any one to judge of the merits of each. Even in the writings of the late celebrated Mr Sharpe, we find a remarkable instance of this. In his treatise on the operations of surgery, he speaks of the radical cure of hydrocele, whether by caustic or incision, or in whatever way it is done, as a very dangerous operation, and seems to think that it will be entirely laid aside *.

At that time it is evident that Mr Sharpe's experience in this disease was not sufficient to warrant a decisive opinion. It

* Tenth edition, Chap. IX.

It proved to be contrary to the direct experience of some of our best surgeons; and Mr Sharpe himself seems afterwards to have been convinced that his first ideas of it had been ill founded *. Still, however, his first opinion had much influence with a great proportion of surgeons; so that, till of late years, the radical cure of hydrocele was seldom attempted but in large hospitals: And when at last it was found that the danger attending it was less than had been represented, still, the terror induced by Mr Sharpe's account of the mode of operating by incision, was such, that almost all who wrote upon it, were afraid of advising it to be so generally performed as it ought to be.

When the earlier editions of this work were published, although I gave the same opinion of this operation that I have now done, and of the preference to which it appeared to be entitled, and although my experience of its utility and safety had at that time been considerable, yet, finding it

* Vide Critical Inquiry, first edition, p. 86.

it spoken of with much caution by many, and among others by Mr Pott, I did not venture to recommend it so warmly for general use, as I am now by much additional experience enabled to do. Although I had performed the operation in a great number of cases, without losing a patient, yet, as in some the inflammation came to a considerable height, I was afraid that in others the dreadful accounts that were given of it by authors might occasionally be realized. This induced me not only to speak of it with caution, but to endeavour, if possible, to discover the cause of the violence of this symptom; for it obviously appeared, not merely from my own observation, but from all the accounts which had been given of this operation, that the danger attending it was always in proportion to the degree of inflammation; and therefore, if this could be rendered moderate, that little or perhaps no hazard would ensue from it.

I did not find that the length of the incision had much influence; for, whether

it was to the full extent of the tumor, or only to one-third of that length, the inflammation appeared to be the same. Some advantage indeed was derived from attending to the direction of the incision; for, wherever it was carried too near the testicle, as is sometimes done at the bottom of the sac, the pain and inflammation were always severe; but the most frequent cause of the violence of these symptoms appeared at last to be the mode of dressing the parts after the operation. It had commonly been the practice to cram a considerable quantity of dressings into the cavity of the tunica vaginalis; and, with a view to make the surface of the parts slough quickly off, a process which at that time was judged necessary for the cure, red precipitate and other irritating substances were made use of by many. The impropriety of these being obvious, dry lint was, by Mr Pott and others, proposed to be used instead of them. This was an important improvement, and it tended more than any other circumstance
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to lessen the dread that had been conceived of this operation by the writings of Mr Sharpe. Still, however, the inflammation run in many instances too high ; the parts swelled to a great size, and the patient, for the first two or three weeks of his confinement, was often kept in much distress and anxiety.

Having frequently found that the dry lint inserted into the tunica vaginalis, adhered, at the first dressing of the parts, so firmly to the surface of the testis, that it could not be withdrawn, I at last began to conclude that this might render the inflammation more severe than it otherwise would be ; and it soon appeared that my conjecture was well founded. For several years past I have covered the pledgets applied to the surface of the testis, as has been advised above, either with fine oil, or with a thin liniment of oil and wax, which answers better. This gives much less pain, in the first instance, than dry lint, and the pledgets never adhere to the contiguous parts ; so that they can
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be as easily removed at the first dressing of the fore, as at any future period of the cure.

The effect of this, and of proceeding in the other parts of the treatment, in the manner I have mentioned, has been, that during all this period the inflammation has never gone farther than I could have wished it to do; never so far as to excite the least cause of anxiety. The testicle swells and inflames, but in no greater degree than is necessary for preventing a return of the disease. Of this the clearest proof that can be given, is, that of upwards of one hundred and fifty patients on whom I have operated in this manner, I have only once found it necessary to advise blood-letting; and very rarely, as I have formerly observed, fomentations or poultices.

I may further mention one important advantage of this operation, in addition to what I have said of it, that it may be considered as absolute security against a return of the disease. I have known indeed

deed two instances, and I have heard of other two, in which the disease returned after this operation was performed. But these are all the instances I can hear of its failure in the course of these last twenty-five years ; and in all of them the cause was evidently traced to want of that persevering attention during the cure, so necessary for the success of every operation, and particularly for that of the hydrocele.

That this operation is not hazardous, and that it may with confidence be relied on against future returns of the disease, I am warranted in asserting, not only from the universal success attending it in this country with others, but from the success arising from it in my own practice.

Almost every operation that had been proposed for the cure of hydrocele, had, by one or other of our surgeons, got a fair trial ; to wit, that by excision, or cutting away the greatest part of the tunica vaginalis ; by injecting wines and other liquids into the cavity of the sac ; by irritation,

ritation, excited with tents of various kinds, both solid and hollow; and more lately by the seton. But, however keenly one and all of these methods had for a time been supported by those who first introduced them, they were at last entirely laid aside; so that, for these last five years and more, scarcely any has been attempted through the greatest part, or perhaps the whole of Scotland, but that by incision: And although, as I have observed above, I have been able to trace a return of the disease in four instances, all of them from causes which ought not to have occurred, not one, so far as I know, has died of the operation.

I have now performed this operation in a very large number of cases, and in every variety of age, from the third to the seventy-fifth year: Not one of the number has either died or been in danger; nor has the disease returned in any of them. In various instances, at first, the inflammation, as I have observed above, arrived at a considerable height; but not

in a single instance, since the operation has been done in the manner I have mentioned.

I have therefore no reason to doubt of the objections which have been made to this operation, being soon done away, and I also believe, that the more it is put in practice, the less dread will be entertained of it. For my own part, I now consider it as a matter of nearly the same simplicity as the treatment of a common abscess in any part of the body. The cure is conducted upon the same principles. It is accomplished in the same time; commonly in less than the cure of abscesses of equal magnitude; and, from the event, I am warranted to say, that it is not attended with more hazard.

Others, from not being so fortunate, and with whom a high degree of inflammation was often induced, not conceiving that this inconvenience could be lessened, either by any alteration to be made in the mode of performing the operation, or in the management of the dressings, were
naturally

naturally induced to make trial of other means of obtaining a radical cure of the disease.

The late Mr James Rae of this place, who was perhaps one of the best-informed practitioners, as I believe him to have been one of the best operators of the age, was, I believe, the first who revived the use of the seton in this kingdom for the cure of the hydrocele. He, as well as Mr Pott, who afterwards wrote upon it, having, from the causes I have mentioned, conceived a dread of the mode of operating by the simple incision; and Mr Rae having previously made many unsuccessful trials of the method of cure by injecting wine and other liquids into the tunica vaginalis testis, they both keenly adopted the practice with the seton. Being strongly recommended by two surgeons of such reputation, it was at first adopted by others; but the inflammation induced by it was found, in some instances, to be so great and alarming, and the distress arising from matter collecting with-

in the tunica vaginalis, and from the openings necessary for the discharge of it, was so considerable, that the practice never got into general use; and it now appears to be laid aside even by those who at one period had formed the most favourable opinion of it. I have not heard of its being performed in a single instance in this place, for these last twenty years: it seems to be falling into disuse in England; and although in some parts of the Continent it was at first adopted, on the recommendation of Mr Pott, I do not now learn that it is ever attempted.

About the same period that Mr Pott wrote upon the use of the seton, the late Mr Else began to revive, with some improvements, the method of curing the hydrocele with caustic; and if any sufficient reason had occurred for laying aside the operation by the simple incision, I would have been of opinion that the method of cure recommended by Mr Else, should have been preferred to every other with which we are yet acquainted. It gives much
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less pain than the seton, and it cures the disease with equal certainty.

The method of cure by excision, that is, by cutting away the tunica vaginalis, cannot be compared to that by the simple incision; for it does not accomplish a cure more quickly, nor with more certainty, while it obviously renders the operation much more tedious and more painful, the chief reasons, no doubt, for this mode of operating being now very generally exploded.

The last variety of operation that has been recommended for the cure of hydrocele, is also the revival of an old one, to wit, the injecting of wine and other liquids into the tunica vaginalis testis.

The merit of first proposing the cure of this disease by injections, has commonly been given to a Mr Munro, a surgeon of this country; but we now have evidence of the practice having been proposed and adopted upwards of fifty years sooner. Tents, armed with irritating ointments, having long been employed, we need not

wonder at injections being considered as a better method of conducting the same remedies to the parts upon which they were to act. Whether injections were earlier used for this purpose or not, we do not certainly know ; but in 1677, there is a third edition of what is intituled *Les Oeuvres Chirurgicales*, of a Monsieur Lambert at Marfeilles, in which a particular account is given of the method of curing hydrocele by injections. The liquid Mr Lambert preferred, was a strong solution of corrosive sublimate, in lime-water ; and he enumerates many cases in which it proved successful. But whether from the pain which it excited being severe, or for other reasons with which we are not acquainted, this mode of operating appears to have been for a long time laid aside, till it was afterwards practised by Mr Munro. Mr Munro at first made use of spirit of wine ; but although it cured the disease, the pain which it excited was so severe, that he immediately laid it aside, and employed wine instead of it.

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The practice being favourably received by some of the first surgeons of this place, particularly by the late Dr Monro, Mr Douglas, Mr Lauder, and the late Mr Rae, it was for some time frequently practised, especially by Mr Douglas and Mr Rae. The liquids they employed were diluted spirit of wine, lime-water, a solution of alum, and red wine, both by itself, and diluted.

But however favourably they were at first induced to judge of the practice, and although very anxious for its success, it was, in the course of a few years, laid aside by all of them, and evidently upon good grounds. The injection either excited severe pain, on being first thrown in, and was succeeded by violent inflammation, and this, in some, by distressful collections of matter; or the cure did not prove permanent. In a few cases, the disease returned almost immediately, that is, in the course of two or three weeks; but this was not frequent. For the most part, the cure appeared to be complete, and con-

tinued to be so, till at some distant period, to the great disappointment both of the patient and surgeon, a recurrence of the swelling was observed. In some, this happened in five or six months ; in others, not till three or four years had elapsed.

About the same period, some unsuccessful trials being made with injections in London, both by the late Mr Sharpe and others, the practice was altogether laid aside there, as it had been here, till of late that some attempts have been made to revive it.

But although for a period of more than forty years, this operation was scarcely heard of in Britain, it was frequently practised in France, and other parts of the Continent, where many trials and experiments were made for curing the hydrocele by injections. Trials were made with spirit of wine, both by itself, and diluted with water ; with a solution of common caustic in water, in the proportion of two grains to the ounce ; with blue vitriol in water, in the same proportions ; with lime-water,

water, both by itself, and with mercurius sublimatus corrosivus dissolved in it in various proportions, from a quarter of a grain to two grains, to the ounce; with strong solutions of alum, of saccharum saturni, infusions of red rose leaves, infusions of oak bark, and with red wine, both by itself, and reduced with water to various degrees of strength, according to the fancy of the operator.

Many give the preference to an infusion of red rose leaves: Others make use of the corrosive sublimate; but it requires, even when much diluted, to be used with great caution. In general, the preference is given to wine: When claret or burgundy are employed, they are commonly mixed with a sixth or seventh part of water; and when port is used, a third or fourth part of water is added. Where no pain is excited by the injection thus diluted, the liquid should be discharged, and pure wine thrown in; for where no pain takes place, a cure is not to be looked for.

The

The operation is done in different ways ; some preferring a lancet for making the opening into the tumor, and others injecting the liquid with a common syringe ; but in my opinion, the best method of performing it is the following.

The surgeon should be provided with a flat trocar, of the form and size represented in Plate LXVI. fig. 3. together with a bag of *resina elastica*, fitted with a pipe, represented in the same plate, fig. 1. The pipe should be somewhat longer than the canula of the trocar, so as to pass about an eighth part of an inch beyond it. If longer than this, it might injure the testis ; and when shorter, the liquid does not pass so easily. The quantity of liquid to be injected should be gently warmed, and put into the bag before the operation is begun. The patient being laid in a horizontal posture, either upon his bed or on a table, and secured in the usual way by assistants, the water should be drawn entirely off from the tumor, by passing the trocar into the anterior, and most depending part of it.

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The operator, securing the canula of the trocar with his left hand, is now, with his right, to pass the tube of the injection bag entirely through it, and with gentle pressure, to force as much of the liquid which it contains into the cavity of the tunica vaginalis, as may be necessary for easily reaching every part of it, as well as the whole surface of the testis. The bag should now be removed, taking care to leave the tube within the canula of the trocar, so that, by turning the stop-cock, the liquid may be retained in the cavity of the tumor. The surgeon should still keep the canula of the trocar fixed, otherwise it might recede, by which the liquid would insinuate into the cellular substance of the scrotum, and in this manner do harm. He should also, with very gentle pressure, make the liquid pass to every part of the cavity during the time it is retained in it; and, at the end of four minutes, it should be entirely discharged through the canula of the trocar, after withdrawing the tube of the elastic bag.

Some

Some have said that the injection should be retained about three minutes: Others think that it cannot be depended on in less than six or seven. But those who have operated most frequently in this manner, are of opinion, that the space of four minutes is better than either. It sometimes happens, that intense pain is given almost instantaneously on the injection being introduced. In this case, it should be discharged as soon as it has been made to pass to the different parts of the tunica vaginalis.

Some again are of opinion, that, after the quantity of liquid first injected is discharged, a similar quantity should be immediately thrown in, and retained for the same length of time, and that the operation will be very apt to fail, if this is omitted. This, however, is seldom done, although, I believe, it would be a real improvement on the operation.

The quantity of liquid to be injected, should always depend on the size of the tumor. Some have thought that it should
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be equal to the quantity drawn off by the operation; but this does not appear to be necessary, while the injecting of such a quantity is apt to do harm. After having collapsed completely, the parts do not again yield easily to sudden distention; so that violent pain has been induced by it. Where the tumor is small, that is, where only five or six ounces of serum are collected, the quantity of injection need not exceed three or four ounces; while it should not be less than seven or eight ounces, where a pound of serum has been drawn off; and in this proportion, according to the size of the tumor.

Less than any of these quantities might answer; but it would require more handling to bring it into contact with all the parts which it ought to touch; and, as a larger quantity is easily introduced, it should always be advised.

On the injection being discharged, and not a drop should be left, the scrotum should be covered with a pledget of common cerate, a compress being applied over it,

it, and retained with a suspensory bag. The patient should be desired to remain in bed for several days, and to give aid to the suspensory bandage, by inserting a small pillow beneath it.

It often happens, that the pain is inconsiderable from the first; scarcely any inflammation or tumor being perceived on the testis; and the patient, considering himself as well, walks abroad, in ten, twelve, fourteen, or fifteen days. But, with others, a very severe degree of pain takes place on the first introduction of the injection, not merely in the testis, but in the back, and over the whole loins. In most instances, this soon becomes moderate, and the treatment goes easily on; but, in others, it is succeeded by great inflammation in the testis and scrotum; and, in a few, this terminates in collections of matter within the cavity of the tunica vaginalis.

These violent symptoms the practitioner endeavours to obviate by blood-letting, a low diet, the use of laxatives, and all
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the remedies usually employed in hernia humoralis ; such as all the saturnine applications ; and warm emollient fomentations and poultices, when suppuration is likely to take place.

When matter forms in the tunica vaginalis, the treatment consists in laying the collection open from one end to the other, and conducting the cure, as has already been advised in the operation by the simple incision. The formation of matter, I believe, is not frequent ; but I know that it occasionally happens ; and so much are the practitioners on the Continent afraid of it ; of the height to which the inflammation might otherwise advance ; and of the dreadful distress that in such circumstances ensue, from suppuration taking place, that they seldom perform the operation without premising purging and blood-letting, and often repeat the blood-letting once and again during the cure, precautions never judged necessary in the method of curing the hydrocele by the simple incision.

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The proportion of those that are radically cured by this method of operating, it is difficult to ascertain; for, although in some the disease returns in the course of two or three weeks; in others, it is not perceived for several months; and, in some, as I have observed above, not till two or three years have elapsed. Hence, in hospital practice, where patients are seldom heard of after being dismissed, the point in question cannot be determined; and it is chiefly in foreign hospitals that hitherto this operation has been performed. From the best information that I have been able to procure, it appears, that although, in many, a complete cure is obtained, yet that the disease returns early, that is, in the space of a few weeks, in a ninth or tenth part of all on whom the operation is performed; and in five of eight or nine, at some uncertain period in future.

Under this conviction, I have judged it proper to state all that has come to my knowledge of what relates to this operation;

tion; and I am the more induced to it, from finding that others, either from an unnecessary dread of the operation by the simple incision, and which I consider as the best and most rational that is yet known, or from a misrepresentation in the accounts they may have received of the method of cure by injection, are again endeavouring to introduce it in Britain.

From the history that I have given of the method of curing the hydrocele by injections, the conclusion that I have formed of it would readily be drawn by any one; but, in addition to this, many powerful arguments may be adduced against it.

I/l, We do not, from experience, find, that other tumors, produced by fluids contained in cysts, are readily cured by injections. Few, I believe, would now think of attempting the cure of abscesses or encysted tumors by injections. In tumors induced by fluids collected in the bursæ mucosæ, where, from the contiguity of joints, extensive incisions might have done harm, I have in various instances,

made trial of injections ; but seldom with any advantage. In some, they excite pain and inflammation ; and where this does not happen, although they may lessen the discharge, this proves only temporary ; so that a cure is afterwards to be obtained by the introduction of a cord, or the enlargement of the opening to as great an extent as with safety can be ventured upon.

Mr Earle, indeed, has said, and he gives it as a reason for the practice he has adopted in hydrocele, that he has frequently succeeded in procuring adhesion and consolidation of parts in sinuses, *and other large cavities*, by injections of various kinds : But, as this has neither happened in the course of my own experience, nor with any other practitioner with whom I am acquainted, I must leave the practice in the hands of those with whom it has answered better.

At one period, a practitioner in this country got into notice, by announcing frequent cures of the fistula in ano as well as other sinuses, by injections. Some timid patients,

patients, both here and from England, put themselves under his care. His reputation, however, was not of long duration; for I do not find that he proved successful in one of twenty cases, although the patients commonly remained long under his care. The injections were thrown in frequently, and with much attention; and liquids of various kinds were employed; some that seemed to act solely by their astringency, and others by exciting inflammation.

2*d*, When the tunica vaginalis has been much distended, as it will not collapse equally round the testicle on the fluid being drawn off, cavities will thus be formed, by which separate collections will be apt to take place, either of a serous fluid, or of purulent matter, if inflammation has been excited. This was my opinion of the probable effect of injections, long before the last edition of this volume was published; and since that period, different cases have occurred, which render it certain that the suspicion was well founded.

3d, When inflammation, excited by an injection, goes too far, and with whatever care the operation is done, it sometimes happens, the distress produced by it is severe. Besides the pain arising from the inflammatory stage of the disease, if supuration takes place, the patient must submit to that painful distention which the sudden formation of matter in this confined state always excites; to the febrile symptoms with which it is attended; and to an incision equally extensive for discharging the matter, as if the mode of cure by incision had been adopted at first.

4th, The state of the testis cannot, in this mode of operating, be examined with the same accuracy, as when the operation is done by incision. Hence it may be in such a state of disease as to be injured by the injection, without our being previously able to discover it.

Some indeed have said, that, on the water being drawn off, we may always know with certainty whether the testicle is sound or not. This when it is much enlarged,

larged, is certainly the case; but where the tunica vaginalis is thickened, as it generally is when it has been long much distended, the testis, if not considerably enlarged, as well as the epididymis, may be materially diseased, without our being able to discover it. Of this I have seen various instances; in some of which, as I have observed above, practitioners of much experience were deceived.

5th, The views of modern surgeons in the cure of the hydrocele, are, as I have already had occasion to remark, to excite such a degree of inflammation over the surface of the testicle, as well as of the tunica vaginalis, as may produce a firm adhesion between them.

Now, instances often occur, in which the tunica vaginalis is so thick, callous, and insensible, that a much more irritating injection would be required to make it inflame than the testicle itself can bear.

Nay, cases are sometimes met with, in which different portions of the tunica vaginalis are as firm and hard as cartilage;

a state highly improper for any attempt to cure the disease by injections, or in any other way than by removing the hardened parts; and yet this sometimes happens, as I have more than once seen, where previously it could not be discovered, and in which the tunica vaginalis testis appeared to be in its usual state, till the contrary was found to be the case, on laying the parts open by simple incision.

6th, The chief, and perhaps only advantage which the mode of operating by injection seems to possess, over that by incision, is, that it is less painful in the execution; but although this may be a reason for advising it with timid patients, who will not submit to the other, it is not sufficient to warrant practitioners in giving it the preference. The prevention of pain is at all times a most desirable object; but it is far from being the only one in surgical operations. Our chief view, is the safety of our patient in the first instance, together with his complete security against a return of the disease. In so far as one
mode

mode of operating is less painful than another, and attended with equal certainty in securing against a relapse, it ought certainly to be preferred; but this is, as I have already had occasion to remark, far from being the case with the mode of curing the hydrocele by injections: So that patients treated in this manner, are, for a considerable time, liable to all the distress and anxiety, which uncertainty in points of importance in every instance gives, while the chief difference between it and the method of operating by incision, which I have shewn to be attended with complete safety as well as security, consists in the degree of pain which it excites being less. This of itself would have little influence even with the most timid, were they to know, that, in the mode of operating by incision, the cutting part of it is done in less than a minute; when the dressings are properly conducted, that the testicle does not inflame more than is necessary for a cure; and that the subsequent pain is for the most part inconsiderable; not to be com-

pared with what is experienced from matter collecting within the cavity of the tunica vaginalis, as sometimes happens in the mode of operating by injection, as well as in that by the seton.

7th, As an argument in favour of this operation, it is said, that when it fails, we still have it in our power to perform it over again, or to advise the radical cure by incision. This, however, leads to much vexation, distress, and disappointment in the first instance, while I think it probable, that one effect of injections, when they do not succeed, must be to render any other operation that may be afterwards performed more uncertain than it otherwise would be, or to require a higher degree of inflammation to be induced. Some have imagined, that injections in the cure of hydrocele prove useful, only in so far as they excite inflammation, and consequent adhesion of the tunica vaginalis to the surface of the testis; whilst others are of opinion, that they act solely by their astringency. By strengthening or corrugating the secreting

ting and absorbent vessels of the parts, they may be supposed to act both by preventing a too plentiful secretion of the fluid naturally contained in the tunica vaginalis, and by promoting a more equal absorption; and we accordingly find, that such fluids only are now used for these injections, as are in a considerable degree astringent, such as infusions of red rose leaves, solutions of alum, and red wine.

My own opinion is, that a permanent cure is never to be depended on, where inflammation is not induced sufficient to produce a firm adhesion between the tunica vaginalis and testis; but there is reason to think, that this seldom takes place from injections; and I conclude that it is so, not only from the trifling degree of pain which, in most instances, the injections now used commonly give, and from the swelling of the parts, which usually takes place, being inconsiderable, but from the disease often returning, after it had been supposed to be cured, and which could
not,

not happen, if these parts had been made to unite by inflammation.

Now, if this is the fact, and I firmly believe it to be so, that injections, in a great proportion of cases, act chiefly by their astringency, and not by destroying the cavity of the tunica vaginalis, they may readily be supposed to render, not only the tunica vaginalis, but even the surface of the testis more callous than it was before, by which a greater degree of inflammation will be required, than might otherwise be sufficient, when any other operation becomes necessary for a permanent cure.

In answer, however, to all these objections, it may be said, that the practice has already gained ground in several parts of the Continent, and that Mr Earle, a surgeon of our own country, has brought forth two publications on the subject, in both of which it is recommended in the warmest manner, and a number of cases recited, in which it appears to have proved successful.

To

To this I shall only observe, what I have already had occasion to do, respecting the practice of foreigners in the hydrocele; that having been later than the British surgeons, in acquiring a knowledge of the true nature of the disease, they have hitherto remained behind them in every thing that relates to it. Their practice has therefore been timid, changeable, and indecisive. This, however, I only mean as a general observation; for some foreigners there are, whose knowledge in this, as in all other diseases, would do them much honour: But all who have read what in general has been written upon this subject by foreign surgeons, or who have had opportunities of seeing their practice, must admit, that in the treatment of hydrocele they ought not to be followed.

And again, with respect to the observation of Mr Earle, I need only observe, that this writer obviously labours under a deep-rooted prejudice against every mode of operating, except that by the sciton, of which he once seems to have entertained

a very high opinion, and the mode of cure by injection, which he has now very keenly adopted. In one part, indeed, of his treatise, he makes the following candid declaration: “ I must confess, that I
“ took *an early and deep-rooted* dislike to
“ the cure of hydrocele by incision*.” Labouring under this kind of terror at other operations, and disappointed, as it would seem, in his expectation of the operation by the seton, he was thus ready to adopt the practice of curing the disease with injections, in the easy manner represented by the French, and which he has accordingly with great zeal done.

If longer experience, and farther improvement, shall evince the mode of curing the hydrocele by injections to be equally safe and certain with that by the simple incision, and shall obviate the objections that I have stated against it, none will be more ready to adopt it than I shall be. In
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* Vide A Treatise on the Hydrocele, &c. by James Earle, Esq; p. 30.

the mean while, and in the present state of our knowledge, few practitioners will advise it, if it be not with those patients whose timidity precludes the more certain and equally safe method of cure, the operation by incision.

S E C.

SECTION IV.

Of the Hydrocele of a Hernial Sac.

WHEN the parts have been long protruded in hernia, a serous fluid collects in the bottom of the sac. In the scrotal hernia, if this extravasated serum is not soon removed by absorption, the tumor, we may easily imagine, may augment to such a size as to afford many of the usual marks of a hydrocele. Accordingly, besides different instances that I have now met of it in my own practice, a number of cases, I find, are enumerated by authors, which sufficiently warrant the insertion of this as a real, and perhaps not an unfrequent, variety of the disease.

It was well known to the ancients, that a considerable quantity of a fluid is frequently

quently contained in the sac of a hernia, along with the parts protruded from the abdomen; but Saviard seems to have been the first who speaks of it with precision. Le Dran relates different cases of it: Heister speaks of it under the title of Hydro-entrocele; and the late Dr Monro describes it with his usual accuracy, and mentions a case of it where six pounds of water were evacuated from the tumor, by an opening made with a trocar*. A case of it is also related by Douglas†, and two cases of a similar nature are mentioned by Mr Pott‡.

The serum is here confined in a cyst, formed by a process of the peritonæum; and, as it occupies nearly the same situation in the scrotum with the hydrocele of the tunica vaginalis, so we cannot always, by the feeling alone, mark the difference between them. For, although the testicle, in this variety of hydrocele, is commonly

* Monro's Works, p. 579.

† P. 182.

‡ Treatise on the Hydrocele, p. 21.

monly distinguished more evidently at the lower and posterior part of the swelling, than in the hydrocele of the vaginal coat, yet, the difference in this particular between the two diseases, is not always so evident as to afford sufficient means of distinction.

When a portion of gut, and other parts forming a hernia are down, the fulness they produce along the spermatic cord, serves, in some measure, to distinguish the disease from a simple hydrocele. And when, along with this and other symptoms of hernia, we evidently discover, in the tumor of the scrotum, a fluctuation of a fluid, if this fluid can, by pressure, be made to disappear, either entirely or in part, the nature of the case becomes thereby obvious.

This variety of hydrocele may take place as readily in the hernia congenita, as in any other rupture; and, in that event, the water must be contained in the same sac with the testicle and protruded intestines.

As

As all the fluid indeed naturally secreted for keeping the surface of the abdominal viscera moist, must, in a congenital hernia, fall into the sac, we would be induced to suppose, that almost every hernia of this kind should be complicated with a hydrocele of the sac. The two cases of this, related by Mr Pott, appear to have been connected with hernia congenita ; and I have met with it in different instances. But whether this commonly happens or not, further observation must discover.

With whatever hernia this kind of hydrocele is connected, if the water can, by pressure, be made to pass into the abdomen, this will always prove certainly characteristic of the disease ; for, in no other species of encysted hydrocele, can the water be made to disappear by pressure. It may happen, however, in this kind of hydrocele, that this distinguishing symptom of the disease does not exist ; for if, by the pressure of a truss, or any other cause, an adhesion is produced in the groin, between

the sides of the hernial sac, if the under part of the sac continues open, with water collected in it, the tumor produced by it will afford all the usual appearances of hydrocele, while no part of its contents can be made to pass into the abdomen by pressure. A case of this kind we find related by Le Dran, where the neck of the hernial sac was shut completely, and a hydrocele formed in the under part of it.

In this situation, the chief means of distinction are to be obtained from an acquaintance with the previous history of the case. When, in an ambiguous case, it is found, that, before the water began to collect in the scrotum, the patient had been liable to a hernia of the same side, this circumstance alone will tend much to determine the nature of the disease. But even although a mistake should occur, and although a hydrocele of a hernial sac should, in such circumstances, be mistaken for a simple hydrocele of the tunica vaginalis, nothing bad could ensue from it; for the treatment adapted to one
variety

variety of the disease, would apply with nearly equal propriety to the other; for here we conclude, that the parts which at first formed the hernia are reduced, and that the sides of the sac, in the upper part of it, adhere firmly together.

But, when the protruded parts still remain down, unless the operation for the bubonocoele is at the same time to be performed, no other should be attempted, but that of discharging the water with a small trocar, when the size of the tumor renders it proper. For, unless the operation for the hernia should be done at the same time, much harm might ensue from exposing the bowels so much to the air, as would necessarily be the case, by laying the tumor open for a radical cure of the hydrocele.

Whenever it is resolved, in this variety of hydrocele, to operate for a radical cure, the simple incision ought unquestionably to be advised; as, from the risk of injuring the bowels protruded from the abdomen, neither the seton, caustic, nor injec-

tions, are here admissible. Indeed, this of itself affords a powerful argument in favour of the method of operating in every instance by the simple incision, which brings all the parts concerned in the disease into view. The very possibility of a patient being killed, by a seton passing through a portion of intestine contained in a hydrocele, is a weighty objection against the seton being ever employed; and every practitioner must acknowledge, that when the spermatic process along the groin is much distended, and the vaginal coat of the testis much thickened, that such uncertainty often occurs, as to render it impossible for the most skilful surgeons to determine with precision, what the contents of such swellings really are. In the instances to which I allude, of a hydrocele connected with a congenital hernia, and which I met with some years ago, there had not been previously any cause to suspect the real nature of the case. They were, by skilful practitioners, judged to be collections of water in the tunica vaginalis,

ginalis, without any complication whatever; and, on the tumor being laid open, together with water in contact with testicle, a piece of intestine was found protruded into the upper part of the scrotum. In one of the cases too, a small portion of omentum accompanied the gut.

In this last, it had been proposed, at a consultation of surgeons, to employ the seton. For some reason or other, this was fortunately rejected; for, on laying the tumor open by incision, it evidently appeared, that if a cord had been introduced, it must in all probability have passed through the protruded gut.

SECTION V.

Of the Anasarcous Hydrocele of the Spermatic Cord.

IN the anatomical description given in the first section of this chapter, it was observed, that soon after the descent of the testis, the passage along the spermatic process of the peritonæum, is completely obliterated, by the sides of the passage adhering together.

By external pressure, and in some instances, perhaps from other causes, this adhesion of the sides of the peritoneal process, is in general very firm in that part of it which passes along the groin; but the superior and more internal part of the process, is not only more loose in itself, but is connected with, and enveloped in a very loose cellular substance.

From

From this cellular structure of these parts, we might, *à priori*, suppose them to be liable to the same kind of anasarcaous or œdematous swellings, with which other parts of the body, of a similar structure, are frequently attacked; and accordingly, we find that this is the case. This anasarcaous swelling sometimes accompanies ascites; and it now and then appears locally, without being combined with either of these.

The causes of this variety of hydrocele in general, are, obstructions produced in the lymphatics, leading from the part, by scirrhus affections of the liver, spleen, and other abdominal viscera. I have likewise known it induced by the pressure of a truss applied for the cure of a hernia*.

When the swelling is connected with anasarca in other parts, it is thereby so distinctly marked, as to render a particular description of it unnecessary. When it takes place as a local disease, its ap-

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pearances

* An instance of this is also mentioned by Douglas. *Treatise on the Hydrocele.*

pearances are these: A colourless tumor in the course of the spermatic cord; soft and inelastic to the feel, and not attended with fluctuation. In an erect posture, it is of an oblong figure, but when the body is in a recumbent posture, it becomes flat. It does not commonly occupy more than the usual stretch of the cord along the groin, but occasionally, it extends down the length of the testicle, and even stretches the scrotum to an enormous size*.

By pressure, the swelling can be always made to recede, never entirely, but often in great part, into the cavity of the abdomen. It instantly, however, returns to occupy its former situation on the pressure being withdrawn.

When the tumor is connected with general anasarca, unless the cause which gave rise to the disease of the constitution is removed,

*. A remarkable instance of this is related by Mr Pott, who, from a swelling of this kind, discharged eleven English pints at once. *Treatise on Hydrocele, case x.*

moved, it would be a vain attempt to endeavour to cure this particular symptom. And it commonly happens, that these swellings in the groin, arising from anasarca, disappear when the disease of the system is carried off.

But when the swelling occurs as an original disease, produced, perhaps, by some local cause; a local remedy is then the best means we can employ. In this case, as we have not the general bad habit of body to encounter, which commonly occurs in scrotal anasarca, we need not be so much afraid of making a free incision into the tumor; and accordingly, all that is necessary to be done is this: As soon as the tumor has acquired such a size as to become inconvenient, an incision should be made with a scalpel from one end of it to the other, taking care to go so deep, as effectually to discharge all the fluid contained in the cells of the part; and as the serum is sometimes found to have acquired a viscid consistence, this circumstance renders a deep incision more necessary than
it

it otherwise would be. In making this incision, we have chiefly to avoid what may be properly termed the constituent parts of the spermatic cord, the spermatic artery and vein and vas deferens, and which, in every instance, may always with certainty be done.

The contents of the swelling being removed, a pledget of soft old linen, spread with common wax ointment, should be inserted between the lips of the sore, which must afterwards be treated as a simple wound from any other cause; by poultices and fomentations, if much pain and a scanty suppuration take place; and by due attention to dressing, so as to induce the formation of firm granulations from the bottom.

In some instances, a cure has been attempted by making deep punctures in different parts of the tumor; but while they do not with such certainty remove the disease, they are equally painful with an incision carried the full length of the tumor.

SECTION VI.

Of the Encysted Hydrocele of the Spermatic Cord.

THE surrounding substance of the spermatic cord being entirely cellular, the formation of encysted tumors, we may conclude, ought occasionally to take place here, as well as in other parts of the body; and accordingly we find, in some instances, that water, instead of diffusing itself over the whole spermatic process, is collected in one or more distinct cells or cysts.

This kind of hydrocele being on its first appearance small, gives little or no trouble, and is therefore seldom much noticed, till it has acquired a larger size. In some, it begins in the superior part of the process; but, in general, it is first perceived

ceived towards the lower part of it, a little above the epididymis. By degrees, however, it stretches upwards, and, in some instances, so far down as to reach from the abdominal muscles to the very bottom of the scrotum; in which case, a person who had not formerly seen the disease, might be apt to mistake it for a hydrocele of the tunica vaginalis. But we have a very certain mark of distinction between the two diseases.

In the commencement of this variety of hydrocele, the tumor is always above the testicle, which is distinctly felt below; and in the more advanced stages of the disease, the testis is found at the back part of it. Whereas, in the advanced state of a hydrocele of the tunica vaginalis, although some degree of hardness takes place where the tunica vaginalis adheres to the testicle, yet when the tumor is large, the testis can never be distinctly felt. In the encysted hydrocele of the cord, the figure and size of the penis is not commonly so much altered,

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as when the water is collected in the tunica vaginalis, in which the penis frequently disappears almost entirely.

In other circumstances, the encysted drop of the spermatic cord, is very similar to the hydrocele of the tunica vaginalis testis. A fluctuation of a fluid is sensibly discovered on pressure. The tumor is commonly of a pyramidal form, which is also the case with the other, with its base or largest extremity downward *. And no pressure has any influence in making it disappear, either altogether or in part.

This is the appearance of the tumor when the water is contained in one cyst. When separated into two distinct cells, as sometimes happens, the line of division is

* A hydrocele of the tunica vaginalis testis, is so frequently indeed of a pyramidal form, with its base downwards, that this shape may be considered as one of the characteristic appearances of the disease; every other tumor to which the testis and its coats are liable, being either more round, or of a more irregular shape.

is commonly evident by the tumor being at that part somewhat puckered, or diminished in its diameter. A similar appearance also takes place, when this variety of hydrocele is combined with a real hydrocele of the tunica vaginalis testis, which, in some instances, happens; and in this case, a line of separation may be observed, where the upper extremity of the tunica vaginalis terminates.

The means of distinction between this species of hydrocele, and that of the vaginal coat of the testis, have already been mentioned. The only other tumors with which it is in danger of being confounded, are, the anasarca of the spermatic cord, and a real hernia, either of the omentum, or of a portion of gut. From the former, however, as also from an omental hernia, it may in general be distinguished. In neither of these, is the fluctuation of a fluid to be perceived, and to the touch they are both soft and inelastic; whereas, in this variety of hydrocele

drocele, the tumor has a springy kind of feeling, and a fluctuation is sensibly found in it. And in both the others, the swelling in some degree recedes upon pressure, which it never does in this variety of encysted hydrocele.

From a hernia of any portion of gut, it is chiefly distinguished by the tumor beginning, not at the ring of the external oblique muscle, as is the case in hernia, but farther down the cord. In the latter, the swelling commonly becomes less on the patient being placed in a horizontal posture ; and it is always considerably affected both by coughing and sneezing ; but no posture, no pressure, nor any accidental circumstance, alters the size of this variety of hydrocele. The absence of the symptoms of hernia, too, is here material in the distinction. For there is neither pain in the tumor, nor in the abdomen ; nor sickness, vomiting, nor any interruption to the passage by stool, as very commonly happens in hernia.

Although

Although all the ancient writers were ignorant of the anatomy of the parts concerned in this disease, it is evident they were well aware of its existence. We find it particularly described by Ægineta, Albucasis, and afterwards by Fallopius, Wiseman, and others. Arnaud, in his *Treatise on Herniæ*, also takes notice of it, though not with much accuracy; and we find it more lately described with exactness by the late Dr Monro, by Douglas, and by Mr Pott.

This variety of hydrocele, as also the anasarcaous swelling of the cord, and the œdematous tumor of the scrotum, are all frequent in infancy. These tumors, however, in childhood, seldom prove permanent. For the most part, they readily yield to gentle friction with volatile liniment, or any other stimulating or astringent application; such as spirit of wine, a strong solution of alum in water, or of crude sal ammoniac in vinegar. The late Dr Monro advises the application of cloths
warmed

warmed with the fumes of burning ben-zoin.

Even the hydrocele of the tunica vaginalis sometimes occurs in early life. I have met with different instances of it in children under three years of age ; but it is not so readily acted upon by the external application of stimulants, as the anasarcaous hydrocele.

Whether in children or adults, when this variety of tumor becomes large, we employ either the means for a palliative, or a radical cure, as have been already advised in the hydrocele of the tunica vaginalis testis.

When it is our intention merely to discharge the water by a puncture, it should be done with a trocar, in the same manner as was directed in Section III. for a hydrocele of the tunica vaginalis ; taking care to introduce the instrument at the most depending part of the tumor. And again, when we mean to accomplish a radical cure, the same means are to be employed, that have been already advi-

fed for the radical cure of that variety of the disease in the tunica vaginalis testis. The same objections indeed do not here occur to the use of the seton, as in the hydrocele of the tunica vaginalis, from the presence of the testis. And if we could, in every species of hydrocele, ascertain the exact contents of the tumor, the seton might, no doubt, be here employed with safety and advantage. But, as it is obvious, from what I have already had occasion to remark, that no certainty of this can at all times be obtained; and, as the hydrocele of a hernial sac, in which a portion of gut is contained, may be as readily confounded with this as with any other species of the disease, I would therefore, even in the hydrocele of the cord, lay this method of cure entirely aside.

An objection occurs, in this variety of the disease, to the method of cure by caustic, which is not applicable in the hydrocele of the tunica vaginalis testis. The serum, in some instances, is collected

ed in two or more cysts ; different cases of which I have met with ; and similar instances of it are related by Garengéot, Douglas, and others. Now, in this situation, if caustic should be applied in the method recommended by Mr Else, upon a small spot only, all the water would not be discharged ; and, in order to obtain a complete removal of the disease, it would be necessary to repeat the application of the caustic to every cyst in which serum might be collected.

This, I think, is an additional reason for our giving a general preference to the method of cure by incision ; which, by laying the tumor open from one end to the other, divides at once all the different cysts of which it may be composed, and saves the patient from that distress and disappointment which must always be experienced, on a complete cure not being obtained, when good reasons had been previously given for expecting it. I would therefore advise the treatment by incision to be preferred in this species of hydro-

cele, as I have done already in the hydrocele of the tunica vaginalis; and the mode of performing the operation, and the after-treatment of the patient, are nearly the same in each.

I have thus enumerated every hydrocele that can be properly considered as forming a distinct variety of the disease. In doing so, as I have described no tumor but such as every practitioner of experience must have met with, and of which the symptoms are clearly and distinctly marked, so it will not, I hope, be considered as an unnecessary degree of minuteness, that I have particularly taken notice of them all.

I can by no means agree with some authors, particularly with Mr Sharpe * and Mr Elfe, who think that it might be better to confine the description of hydrocele to two varieties. We need not indeed wonder at Mr Sharpe speaking in this manner; for, even at the late period
in

* Treatise on the Operations of Surgery.

in which he wrote, although the existence of all the varieties of the disease that I have mentioned had been described by different authors, yet they were not understood with much accuracy; and it is evident from Mr Sharpe's writings on the subject, that his ideas of them were in many respects more confused than might have been expected in one of his usual accuracy and penetration. But, whatever was the case with Mr Sharpe, it is truly surprizing, that those who are unquestionably well informed in every circumstance relating to this disease, and who must be convinced, from frequent dissections, of the existence of all the varieties that I have been mentioning, should object to their being retained. Where no evident or marked distinction occurs between one tumor and another, an attempt to establish a difference would be useless, and therefore improper; but where appearances point out an obvious variety, it would surely be considered as much want

of accuracy in an author to omit the detail of them.

In the description that I have given of the five different species of hydrocele, to wit, the anasaruous swelling of the scrotum, the hydrocele of the tunica vaginalis testis, the hydrocele of the hernial sac, the anasaruous and the encysted hydrocele of the spermatic cord, it was necessary to enumerate the symptoms of each, as they occur separately and uncombined. It sometimes happens, however, that one, two, or more of the different varieties occur at the same time in the same patient. I have met with instances of three, and not unfrequently with two varieties in the same person. The late Dr Monro mentions an instance of four species of hydrocele being all combined in one case*.

In such cases, some difficulty and confusion is, no doubt, to be expected; but practitioners, in forming a judgment of their nature, must be entirely directed by
due

* Vide Monro's Works, 4to, p. 576.

due attention to the various symptoms which take place in each variety of the disease, when met with separately, and unconnected with others.

We now proceed to the consideration of the other varieties of false hernia ; and first of the hæmatocele.

CHAPTER XXV.

On the HÆMATOCELE.

THE hæmatocele is a tumor in the scrotum or spermatic cord, produced by extravasated blood.

The usual seat of this disease is in the tunica vaginalis of the testis; but, in some instances, it is seated in the spermatic process, and occasionally it is met with within the dartos.

The hæmatocele always arises from the rupture or division of one or more blood-vessels, and it is most frequently the effect of external violence. Blows upon the scrotum, and bruises received in riding, sometimes

sometimes burst the veins, not only in the cellular substance of the scrotum, but in the vaginal coat of the testicle. Accidents of a similar nature have produced similar affections in the course of the spermatic cord ; and, as the parts in this situation are soft and cellular, the rupture either of an artery, or a vein of any considerable size, is, for the most part, attended with a plentiful extravasation of their contents.

In the tunica vaginalis testis, a hæmatocele is sometimes induced by the point of a trocar, or of a lancet, in tapping for a hydrocele, wounding some of the blood-vessels of the sac, which, in such cases, are commonly enlarged.

We become certain of what has happened, by the serum, as it runs off, being suddenly tinged with blood ; but, in some instances, this does not appear till the collection is all discharged, when the first intimation we receive of it is by the sudden appearance of a tumor in the site of the hydrocele. I have now met with various instances

instances of this, in all of which the tumor produced by the extravasated blood arrived at a very considerable height in the course of a few hours.

In some, the disease is produced in a different manner. Where the quantity of serum has been large, the sudden discharge of it, by taking away the support which the vessels have been accustomed to receive from it, is not unfrequently the cause of the rupture of some of them; and, from repeated observation, I think it may be considered as certain, that whenever a large tumor is produced suddenly, that is, in the course of an hour or two, either in the scrotum, or spermatic cord, after the contents of a hydrocele have been discharged by tapping, that it arises entirely from extravasated blood; for collections of water are never known so quickly to become large.

In the spermatic process, injuries of the same kind will be attended with a similar effect upon the small veins of the sac containing the water; and more considerable
violence

violence has, in some instances, produced a rupture of the spermatic artery and vein.

But, in whatever way the tumor has been produced, the appearances are nearly similar to those of watery collections in the same parts ; so that it is not necessary to repeat them here ; only it may be remarked, that, when blood is extravasated in the cellular substance of the scrotum, it is easily distinguished from a collection of water by the colour, as it assumes all the usual appearances of an echymosis. When the collection is seated in the tunica vaginalis, the means of distinction are not so obvious ; but I may remark, that a tumor produced by blood is heavier than one of the same size produced by water ; and practitioners, much accustomed to handle these swellings, can in some instances judge of their contents from their consistence, by the difference which this gives to manual examination.

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The treatment of this kind of tumor is nearly the same with that which I have advised in Sect. IV. Chap. XXIV. In the commencement of the anasarca or diffused hæmatocele, when produced by external violence, whether in the scrotum or spermatic process, the application of ardent spirits, a solution of alum, volatile liniment, or a strong solution of sal ammoniac in vinegar, will, in some instances, remove it. But, when this does not succeed, and especially if the tumor acquires a greater bulk, it must, in that case, be laid open, and, in every respect, treated in the same manner as has been already directed for the hydrocele; only I may remark, that, if a ruptured bloodvessel is discovered, the only effectual means of preventing a return of the tumor, is to secure it with a ligature.

In like manner, all collections of blood, whether in the vaginal coat of the testis, or in the cyst of a former hydrocele of the spermatic cord, are to be laid open by an incision, extending the whole length
of

of the tumor, and, in other respects, treated exactly as I have advised in the fourth section of the preceding chapter, for a hydrocele. And I need scarcely observe, that, if any ruptured vessel comes in view in the course of the operation, it ought to be immediately secured with a ligature: otherwise a constant discharge of blood may be looked for during the cure; the patient will be thereby much incommoded and weakened, and the cure unnecessarily protracted.

It sometimes happens, however, whether the disease is seated in the spermatic process, or tunica vaginalis testis, that the vessels from whence the blood is discharged cannot be discovered; a very considerable oozing, continuing from day to day, notwithstanding the use of bark, vitriolic acid, and every other means that are commonly employed. As patients in this situation soon become weak and emaciated, one great object of the practitioner is to support them with nourishing food. A moderate allowance of animal food
proves

proves always useful ; nor is it found that a liberal use of wine does harm. In some instances, I have even thought that it tended to lessen the discharge.

I have uniformly, however, found, that local remedies prove chiefly useful, particularly the application of ardent spirits, ether, or tincture of myrrh, to the surface of the fore : pledgets of soft lint, soaked in one or other of these, and renewed from time to time, not only serve to check the discharge of blood, but tend, for the most part, to promote the formation of good matter.

In some instances, however, all our endeavours fail, and the patient continuing to lose ground daily, we are warranted in advising any measure that may probably tend to save him. In such circumstances, the extirpation of the testicle has been advised. At one time, I was induced to think favourably of this measure ; but further experience has not shown, that much dependence is to be placed on it. At least, in two cases, in which it was

was put in practice, no advantage was derived from it; while, in both, it was the cause of much additional distress. I do not therefore mean ever to advise it again.

Another variety of tumor produced by blood is mentioned by Mr Pott, in which the blood is contained within the tunica albuginea of the testis. It proceeds, he thinks, from a relaxation or dissolution of part of the vascular structure of the testicle; and, when the quantity of blood collected is considerable, it produces, Mr Pott remarks, a fluctuation somewhat like to that of a hydrocele of the tunica vaginalis.

When this is mistaken for a hydrocele, as it has sometimes been, and an opening with a trocar is made in it, a discharge is produced, of a dark dusky coloured blood, nearly of the consistence of thin chocolate; but the diminution of the tumor, by this evacuation, is seldom considerable.

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The perforation, therefore, made in it with the trocar does no good ; and as the testicle is commonly so far spoiled by the disease as to be rendered entirely useless, castration is advised as the best remedy *.

I have different times met with a disease very similar to this described by Mr Pott : but as the blood in such instances did not appear to be extravasated, but to be still contained in the vessels of the testis, in an enlarged varicose state, I am not inclined, therefore, to refer this kind of tumor to any species of hæmatocele, but rather to consider it as a variety of varix. I have even seen this variety of tumor mistaken for a hydrocele, and treated as such, by a trocar being plunged into it, when the effects were exactly what are described by Mr Pott. But, if the blood had been extravasated, a more copious discharge would have taken place from the perforation, than was obtained by it in any of the cases to which I allude. Even where the tumor has

* Mr Pott's Treatise on the Hydrocele.

has been of a considerable size, I never found it possible to evacuate in this manner more than a spoonful or two of blood, and although, in such cases, the blood appears evidently more viscid than in a state of health, this is not in such a degree as ought to prevent it from being freely discharged by the canula of a trocar, were it lodged in a state of extravasation.

In all the cases that I have seen of this tumor, when it was not opened, but merely supported by a suspensory bag, it has remained indolent and stationary for many years. But whenever it has been touched with an instrument in order to discharge its contents, it has from that moment gone wrong. The patient who had suffered little previous pain, soon became greatly distressed; the swelling then began to increase; separate encysted collections formed in it; these at last burst and left an ugly sore of an unequal surface, and a putrescent bloody discharge, on which no application had any effect; so that castration at last became necessary.

Even this does not always afford relief; for, in some instances, such a spongy relaxed state of the vessels takes place along the whole course of the cord, that, though they are secured with ligatures to-day, blood bursts out at different parts to-morrow. Of this I was once concerned in a very distressful instance. After the usual operation of castration, fresh hæmorrhagies occurred at every dressing; the vessels were at different times secured with ligatures, but to no purpose; the blood burst out again and again; and the patient, after suffering much distress from this cause alone, at last died.

The chief differences which, before laying the parts open, can be observed between this variety of tumor and a hydrocele of the tunica vaginalis, is, that in this, the fluctuation is never so evident as in the other; the tumor is heavy in proportion to its size; the form not so pyramidal as that of a hydrocele; and if properly supported with a bandage, it does not receive any additional increase.

Whenever

Whenever these circumstances, therefore, occur in the same case, they give much reason to suspect, that the disease is of this kind; and therefore, that no operation should be advised. The patient should be desired to trust entirely to a well-adapted suspensory bag; to avoid severe fatigue; and to prevent a costive state of the bowels, which in all diseases of these parts, very constantly does harm.

END OF VOLUME FIFTH.

L12

EXPLA-



PLATE XII.

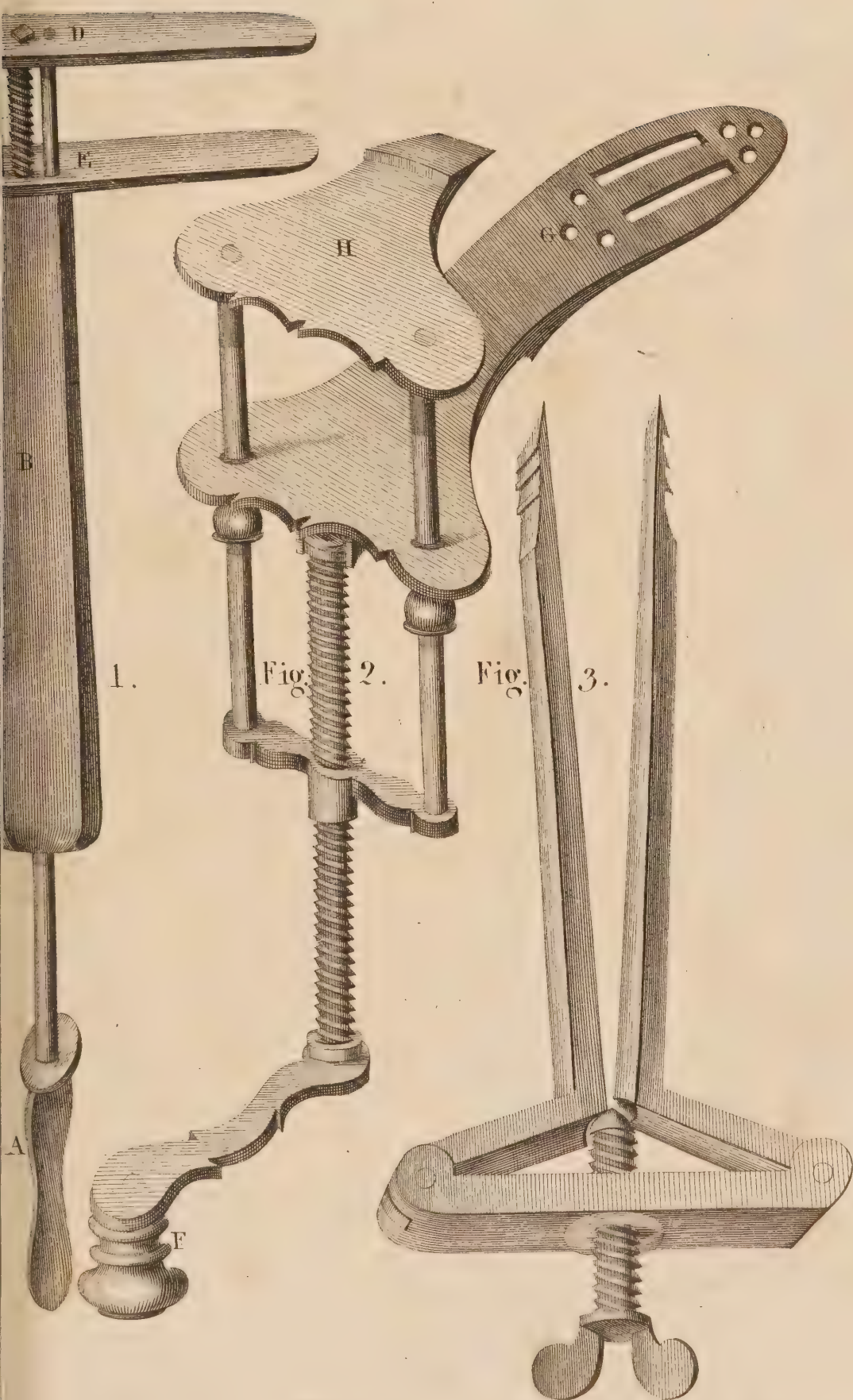


PLATE XIII.

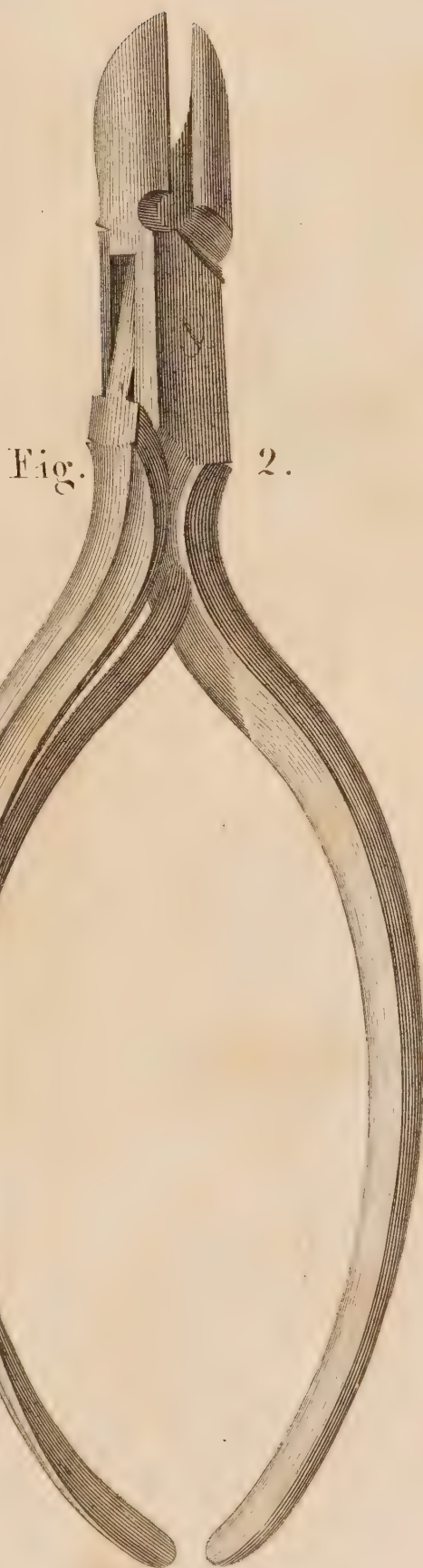
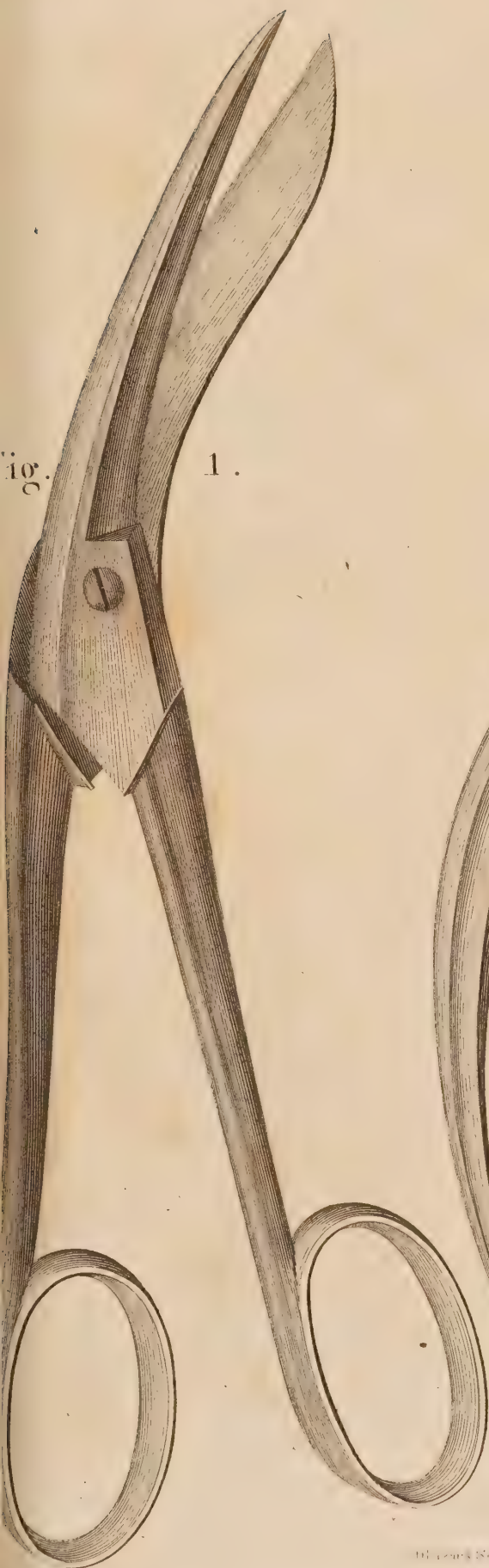


PLATE XLIV.

Fig. 1.

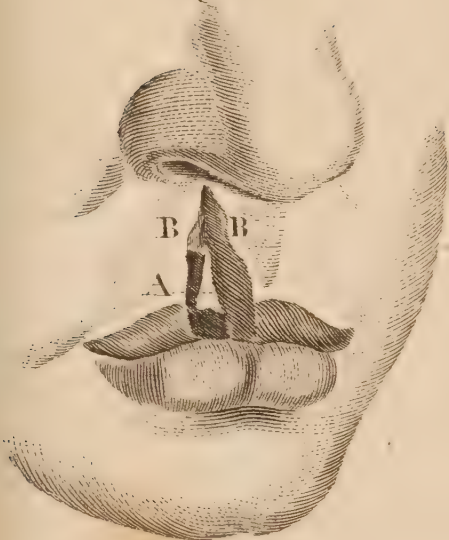


Fig. 2.

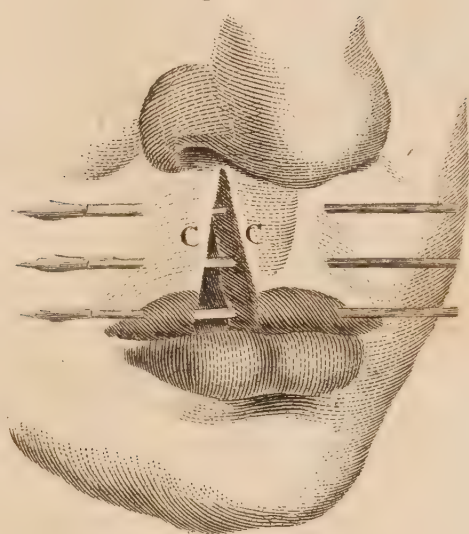


Fig. 3.

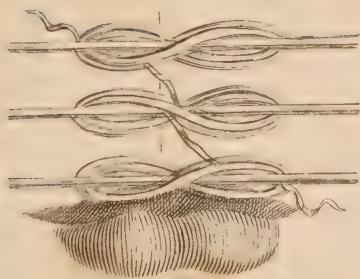


Fig.

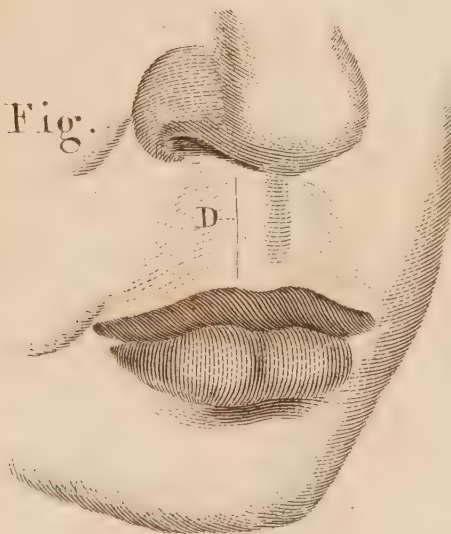


Fig. 5.



Fig. 6.



Fig. 7.



PLATE XLV.

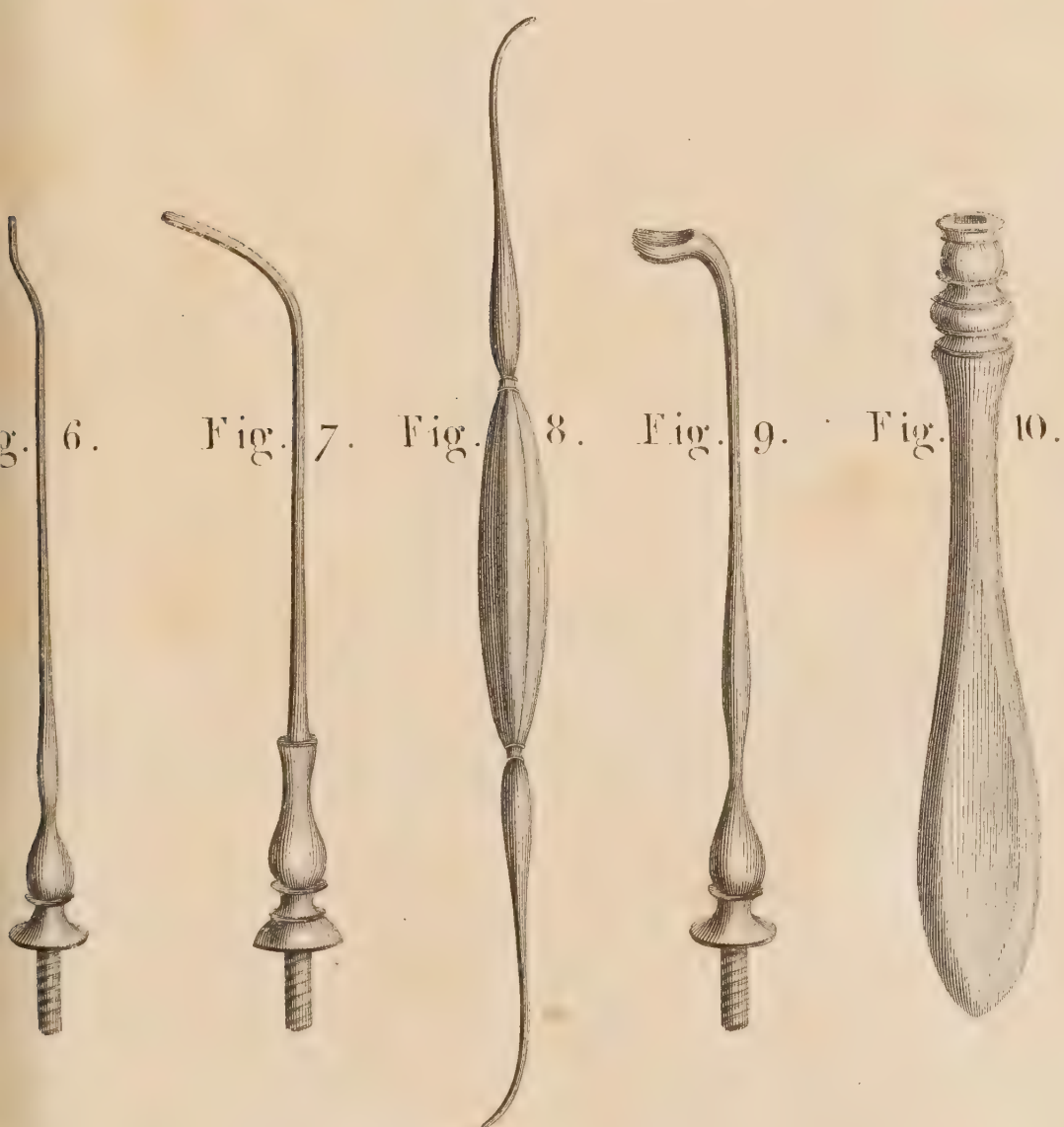
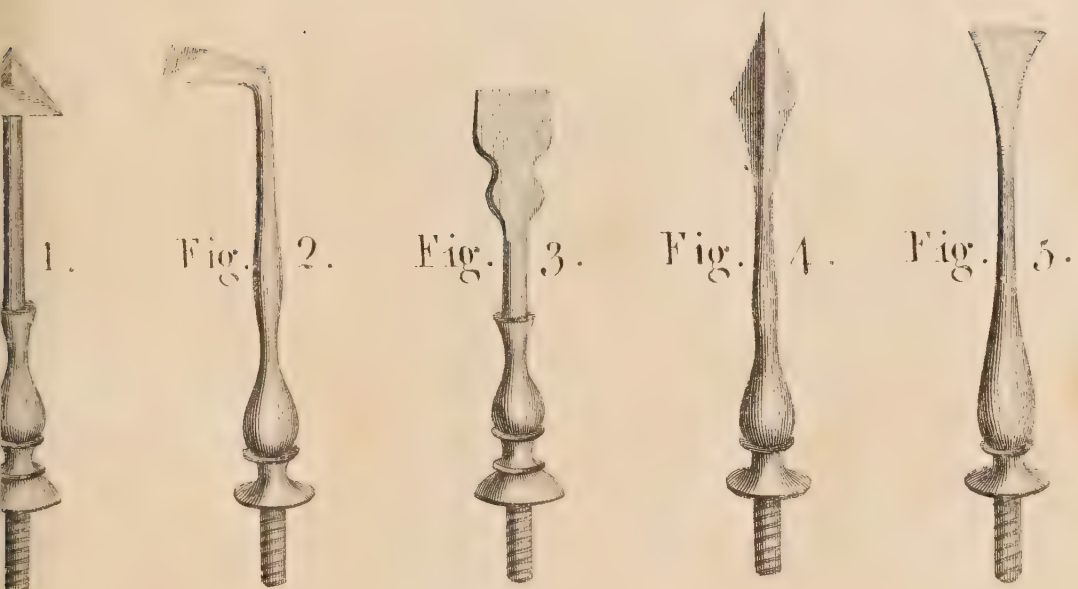


PLATE XLVI.

Fig. 1.

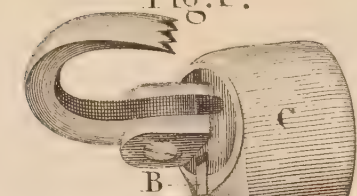
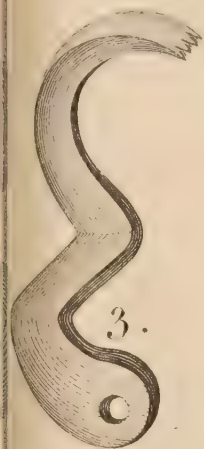


Fig.

2.



3.



4.

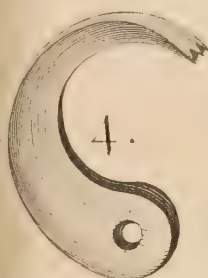


Fig. 5.



PLATE XLVII.

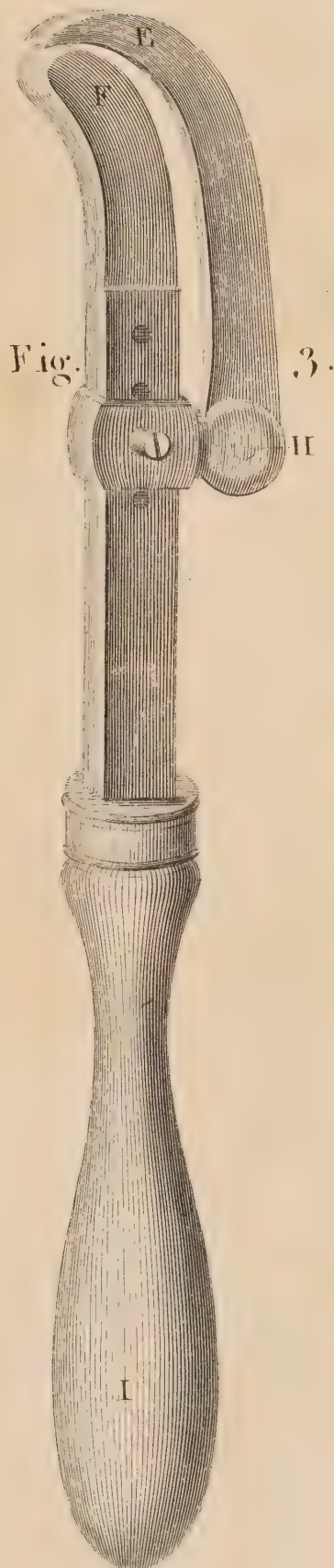
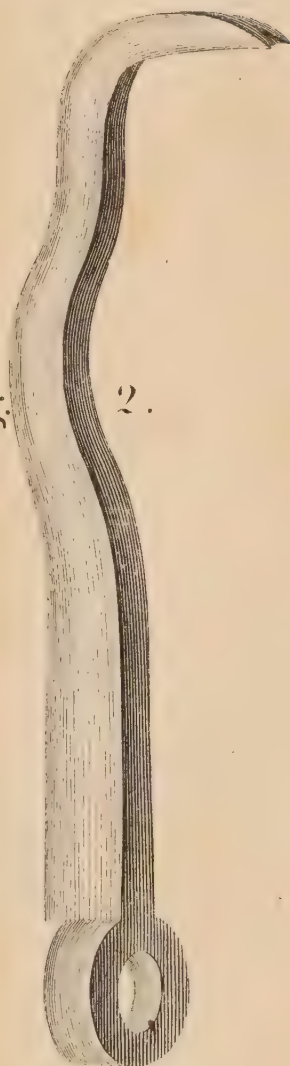
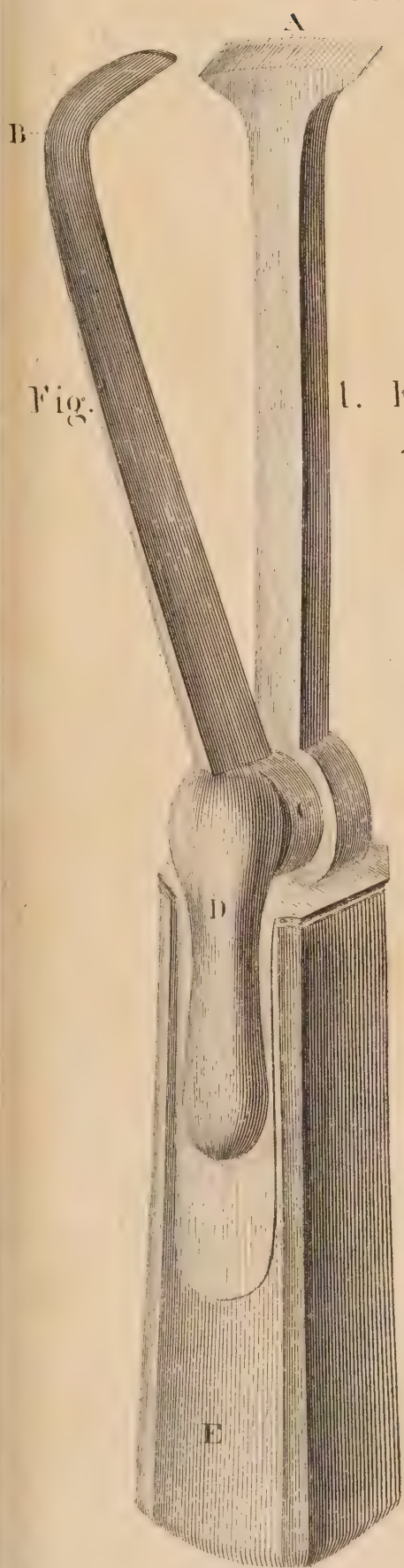


PLATE XLVIII.

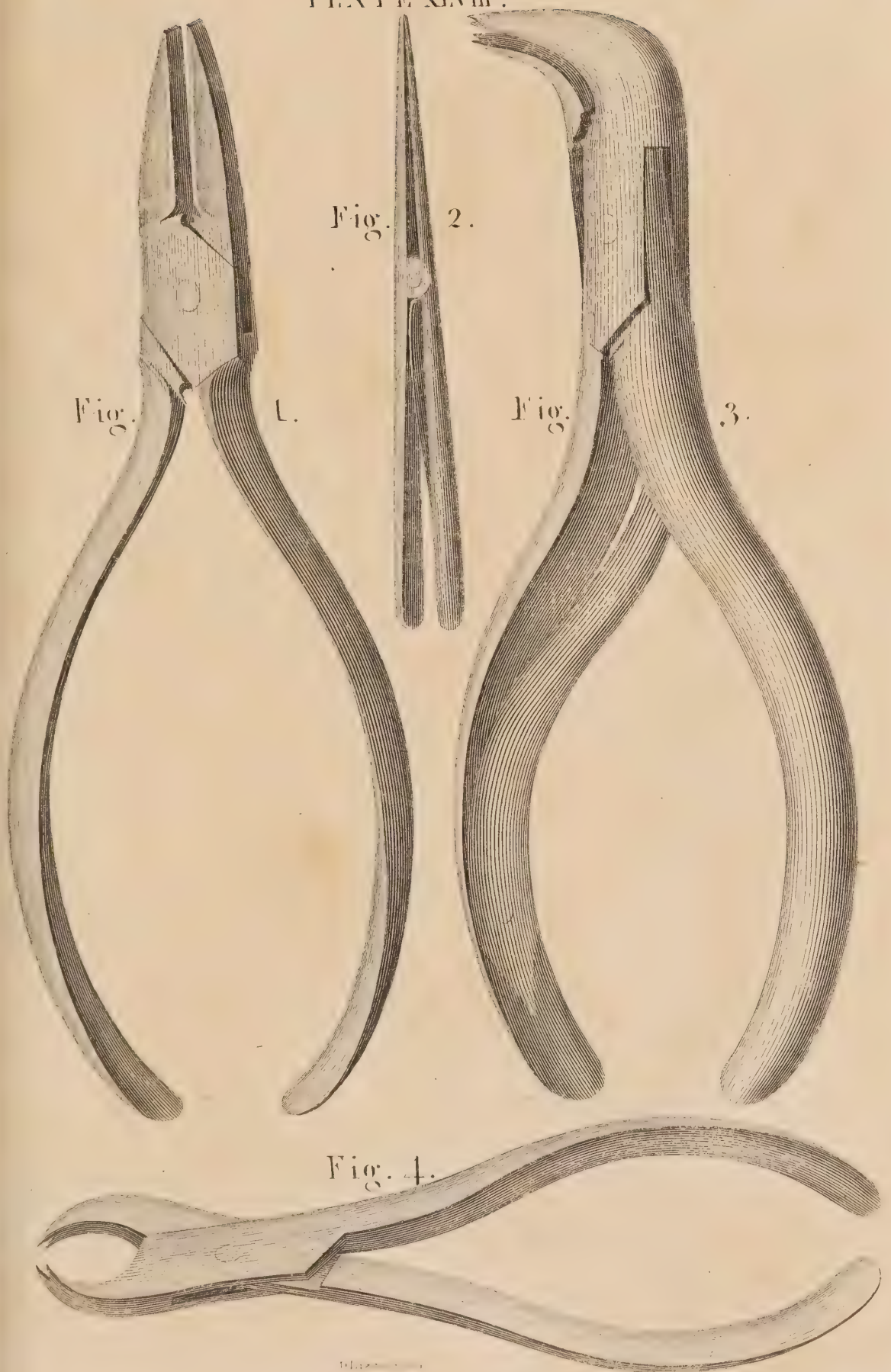


PLATE XLIX.

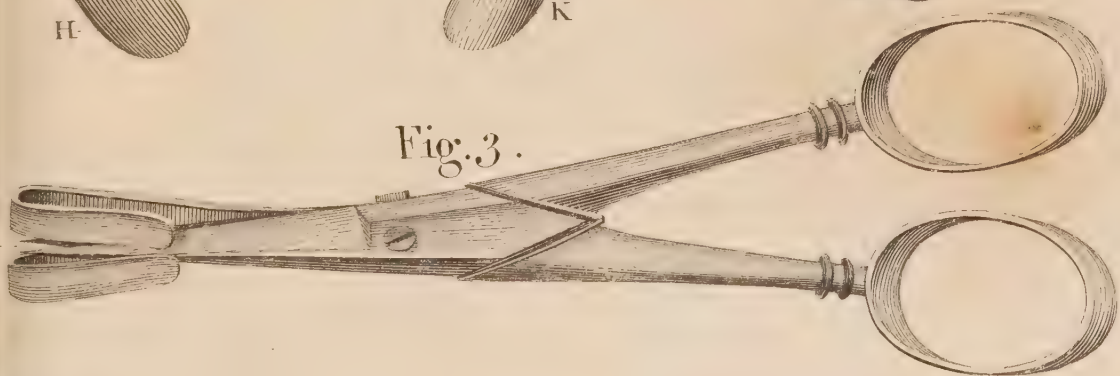
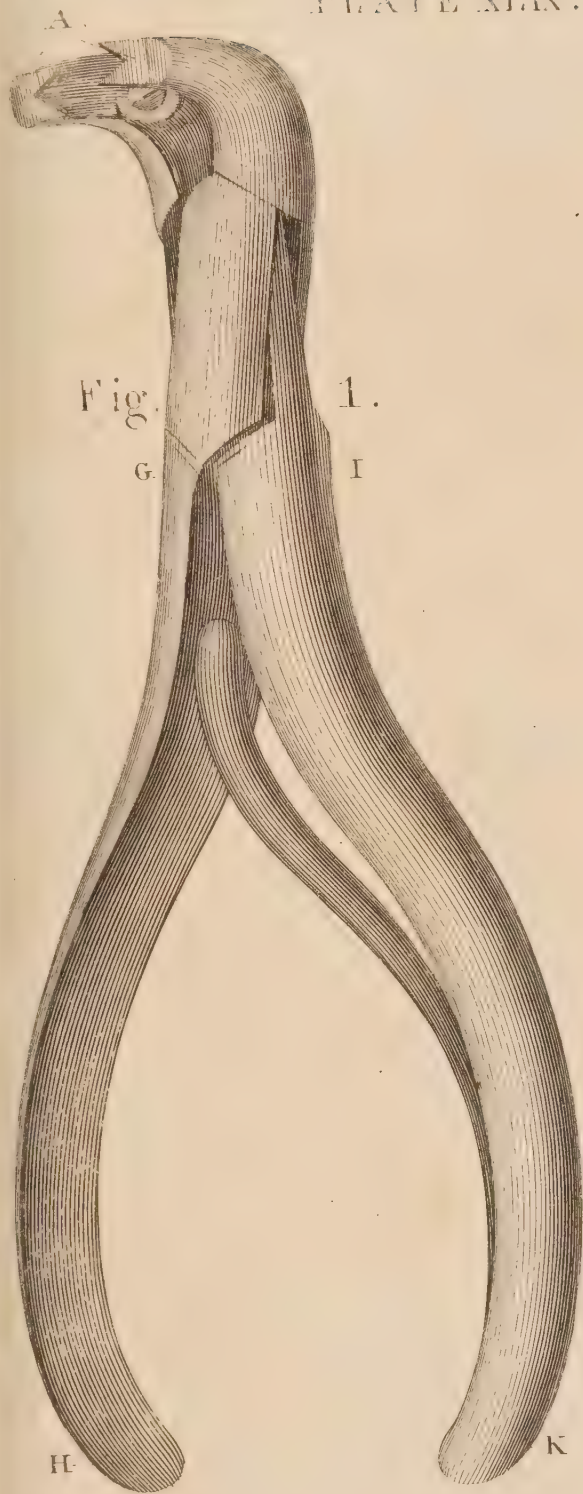




PLATE I.

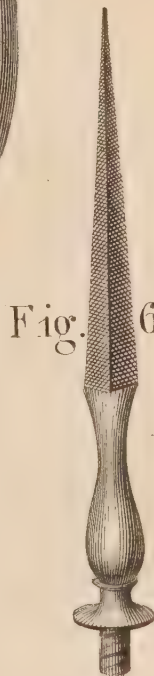
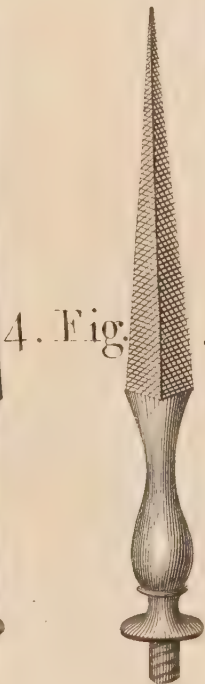
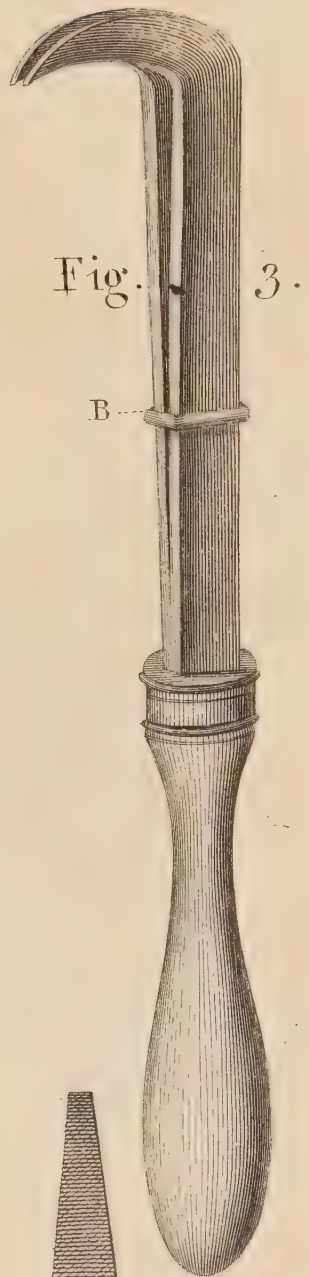
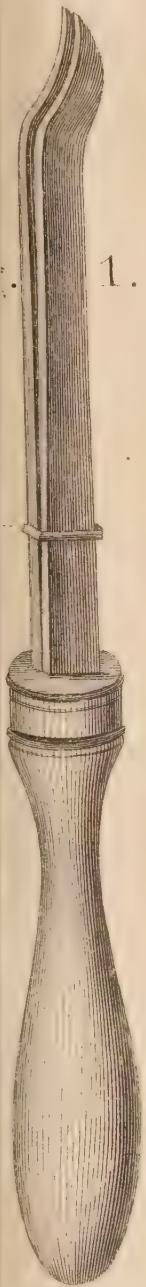


PLATE LI.

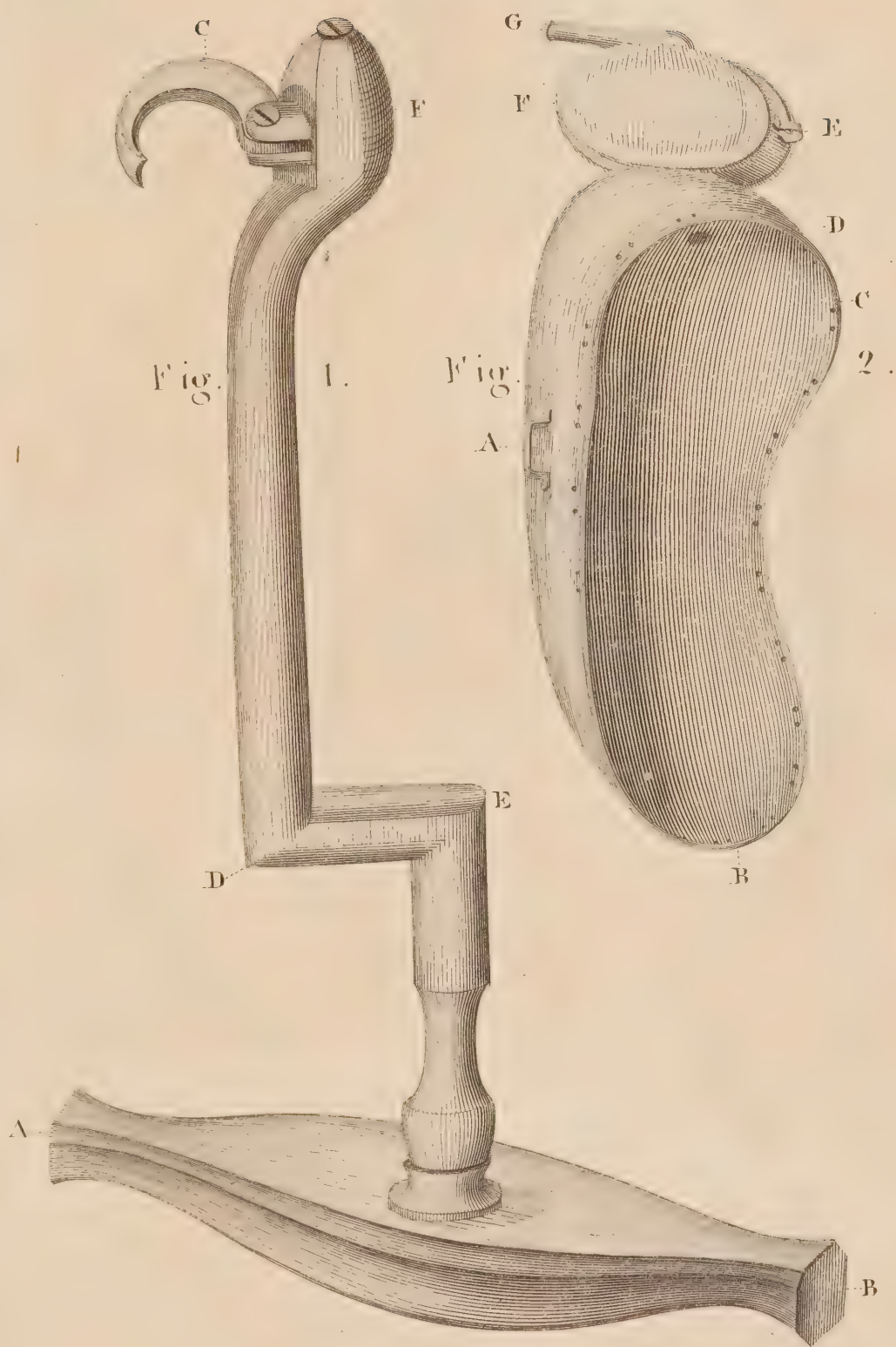


PLATE I. II.

Fig. 1.

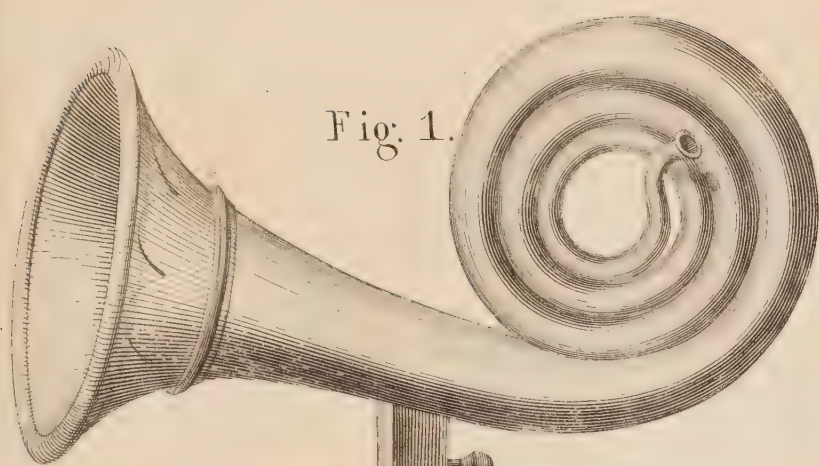


Fig. 2.



Fig. 3.



Fig.

4.

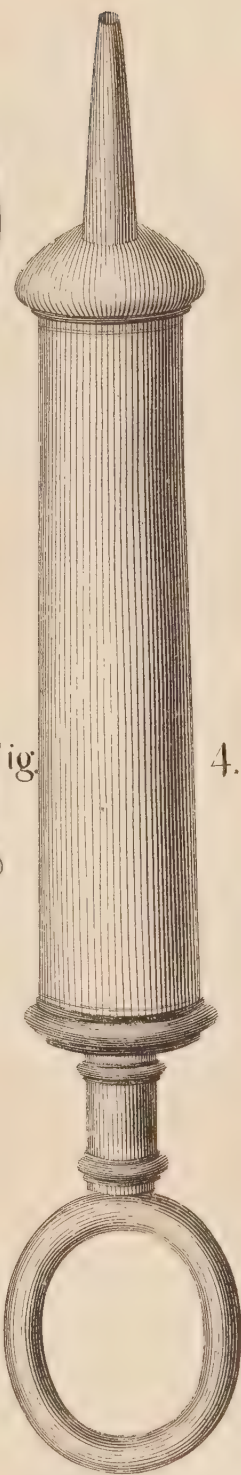


Fig. 5.



Fig. 6.



PLATE LIII.



Fig.

1.

Fig 2.

Fig.

3.

A

B

C

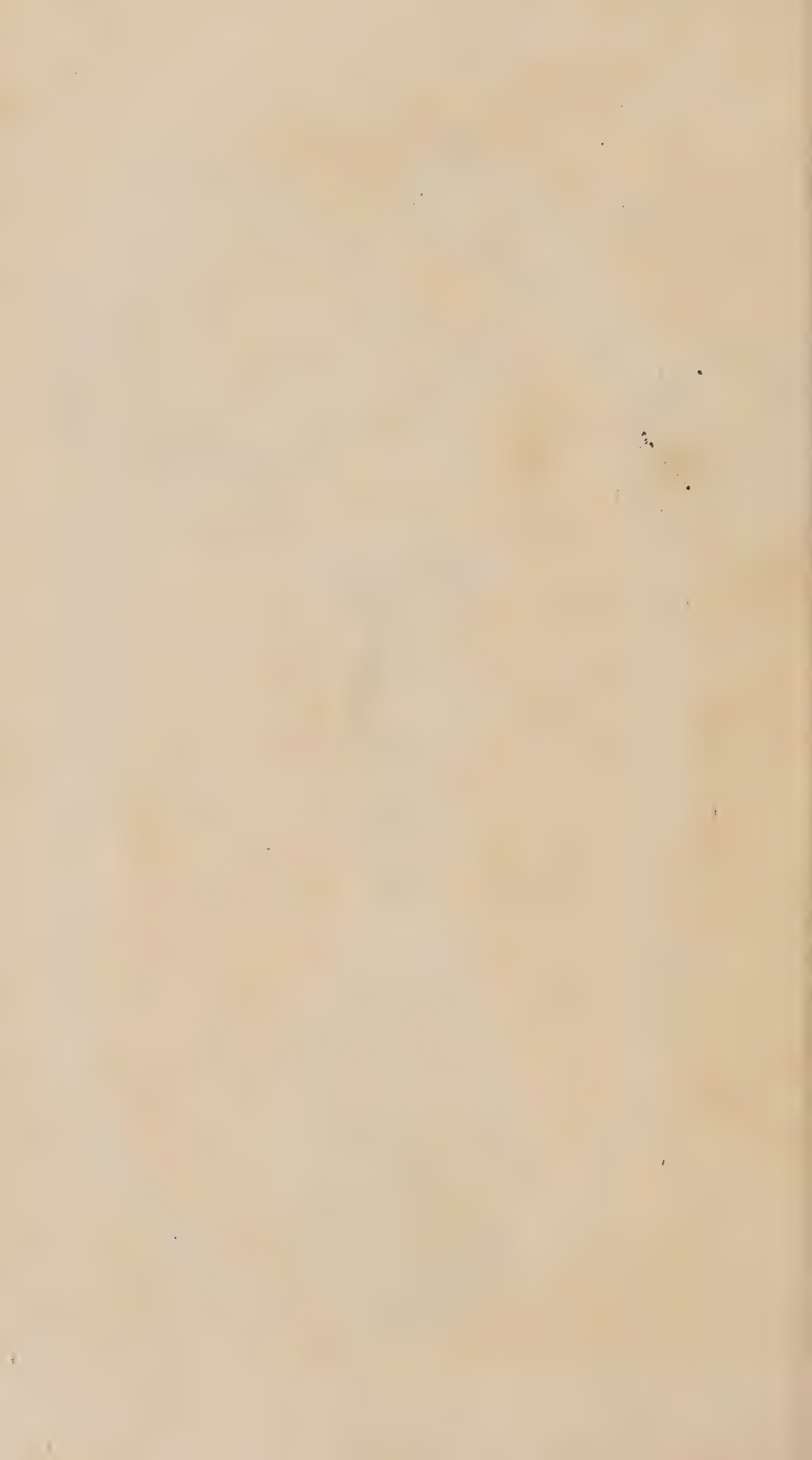


PLATE LIV.

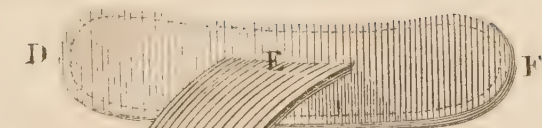


Fig. 1.

Fig. 2.

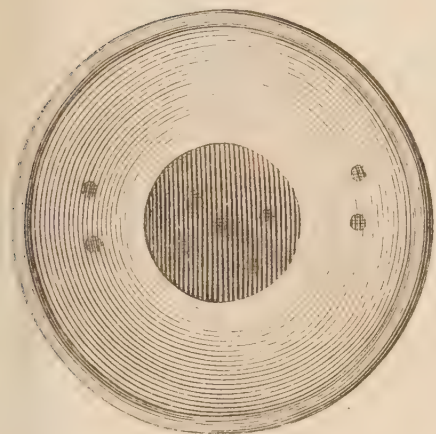


Fig. 3.

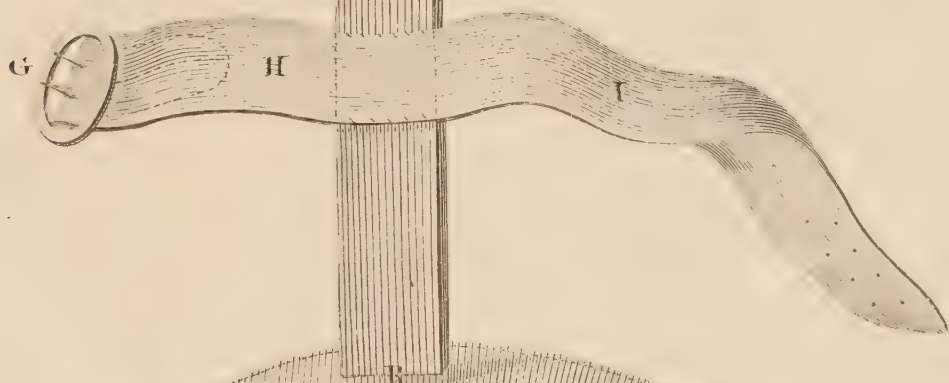
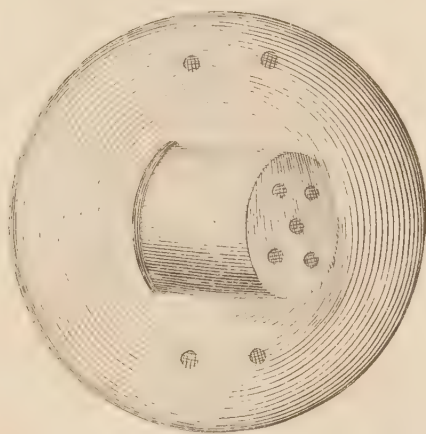


Fig. 4.

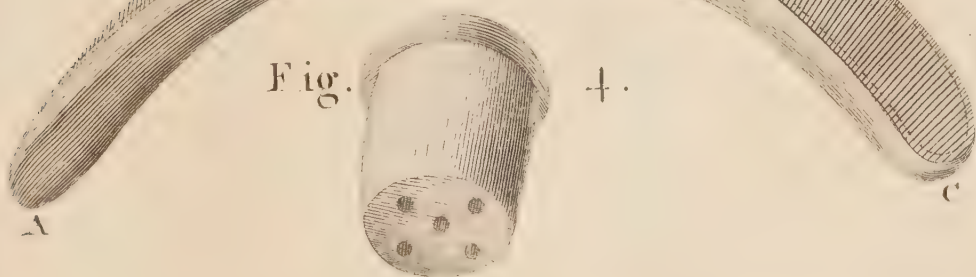


Fig. 5.

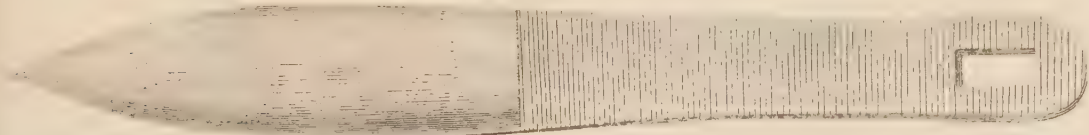


PLATE LV.

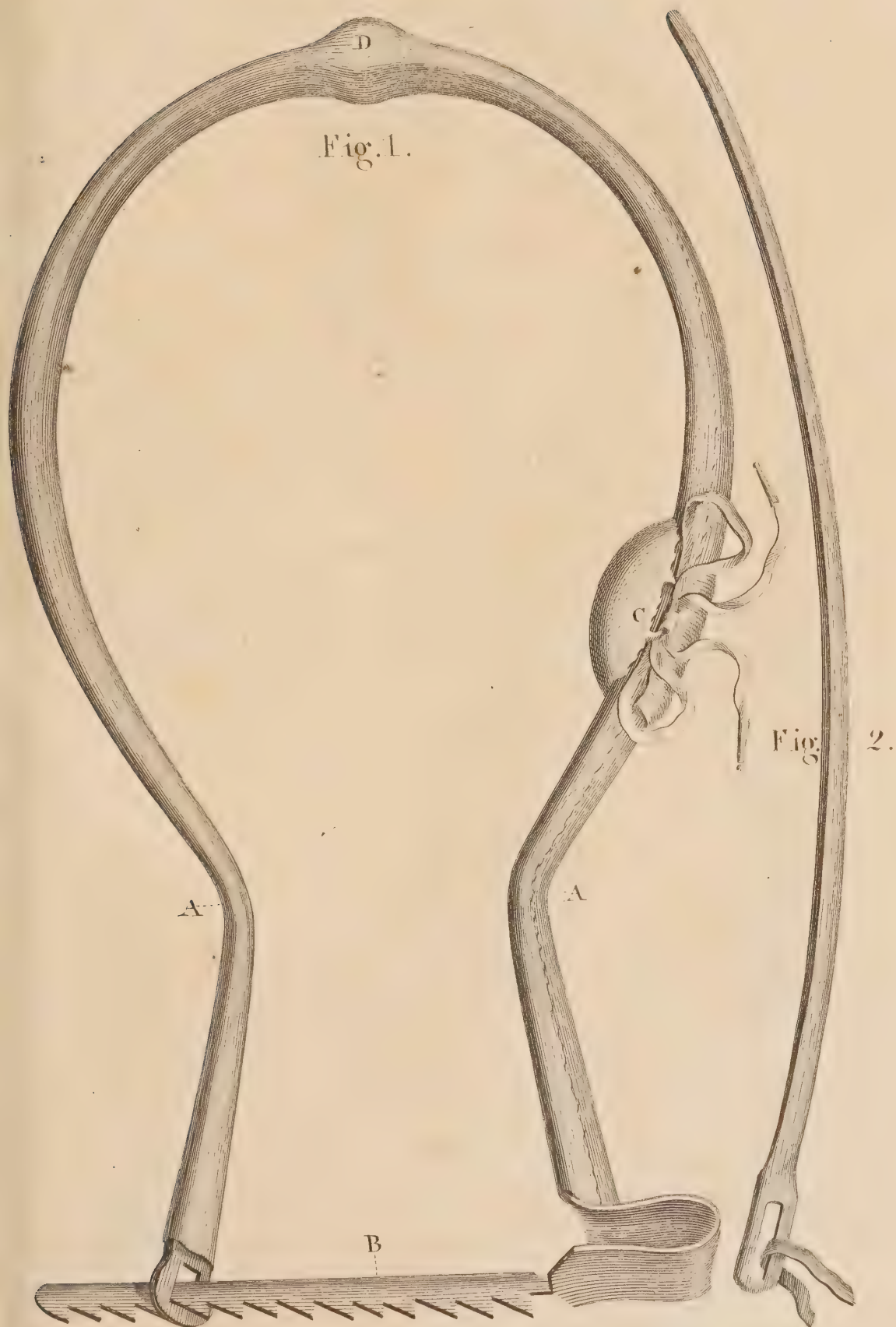


PLATE IXL.

Fig. 1.

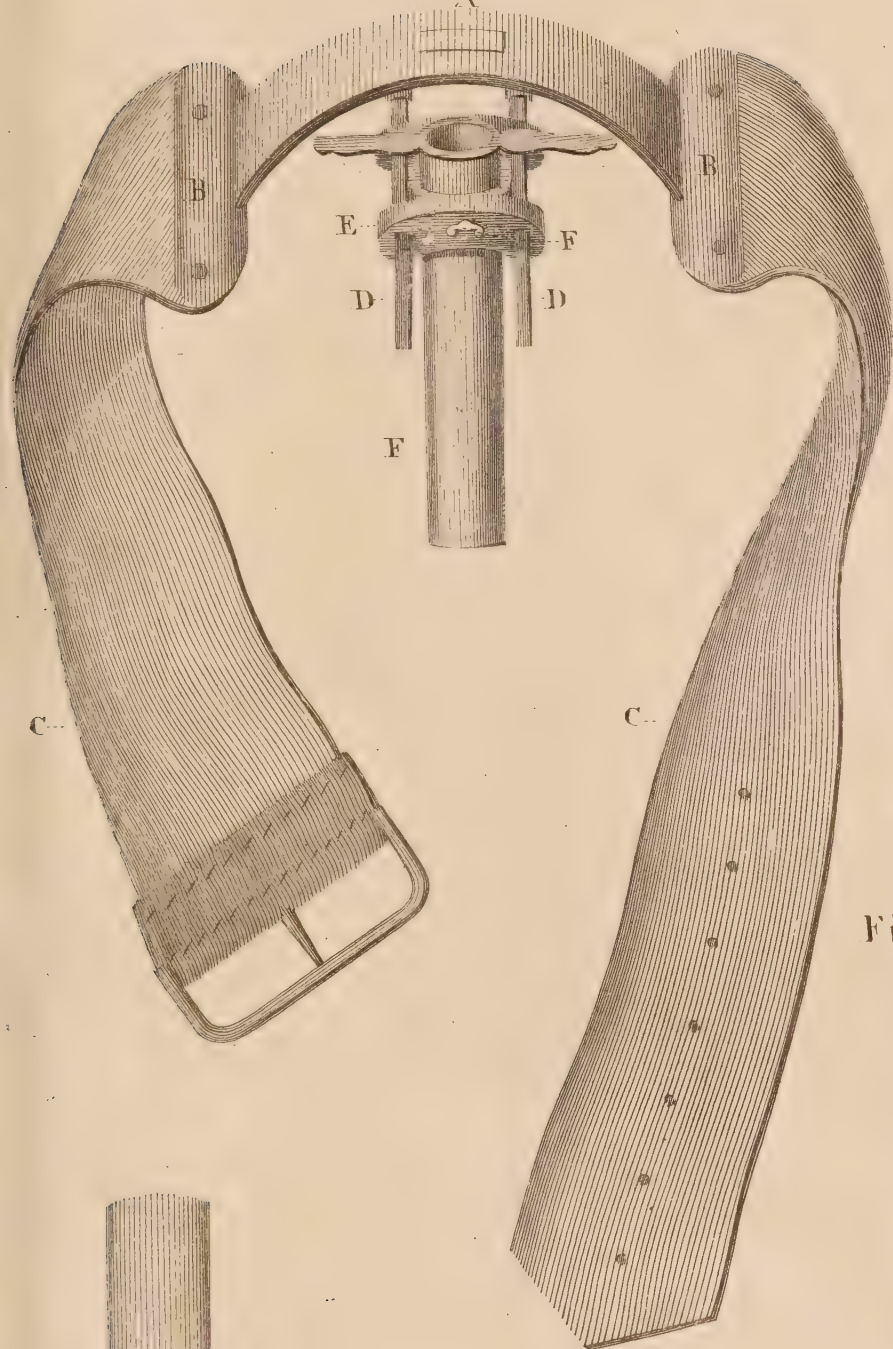


Fig. 2.

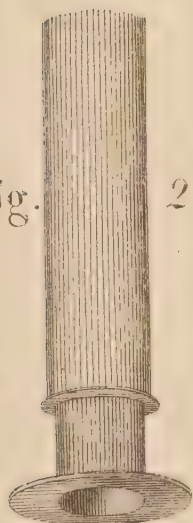
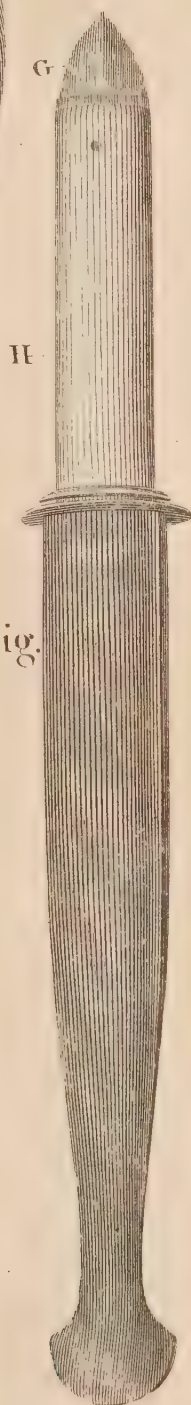


Fig.

3.



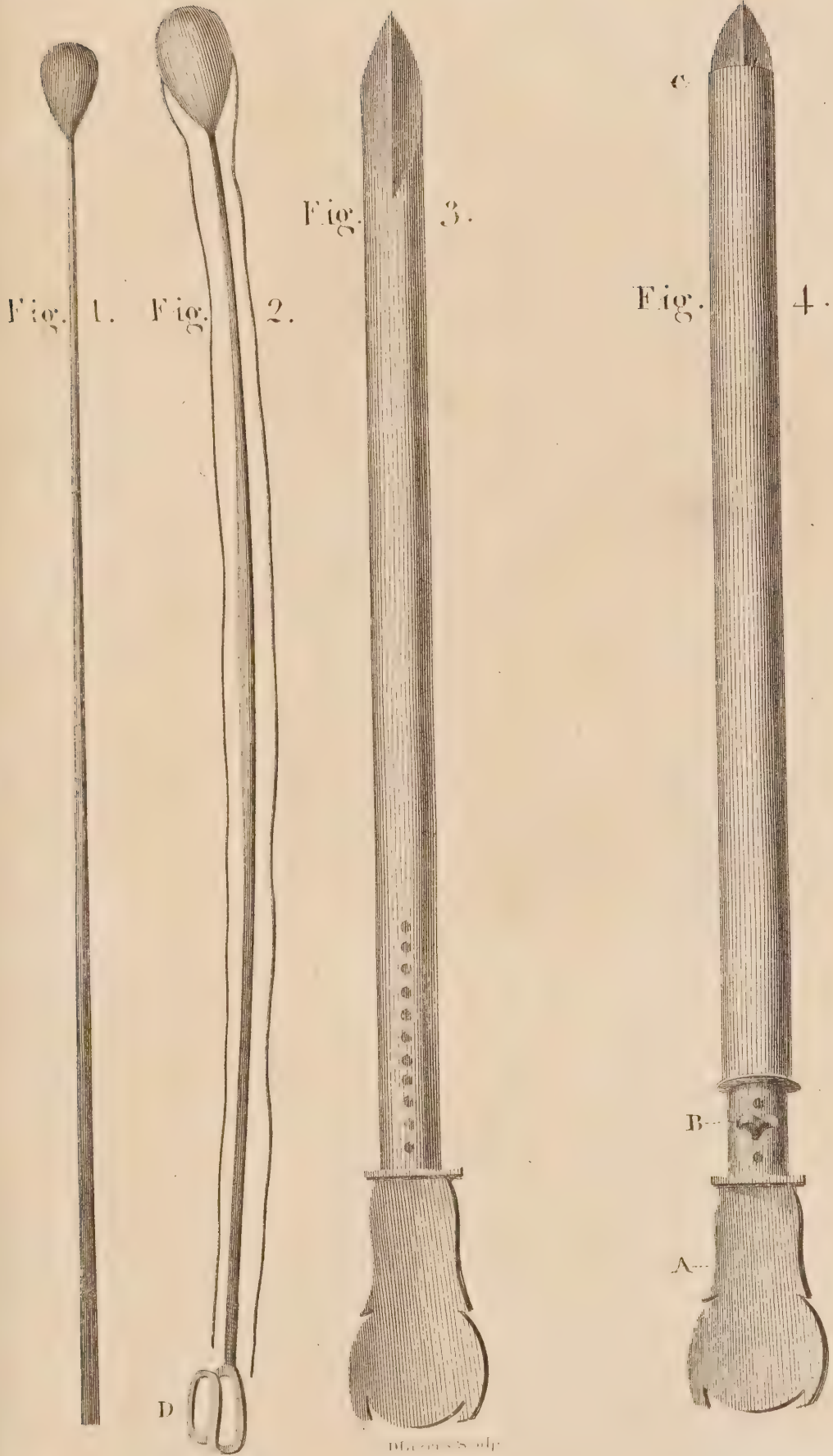


PLATE LVIII.

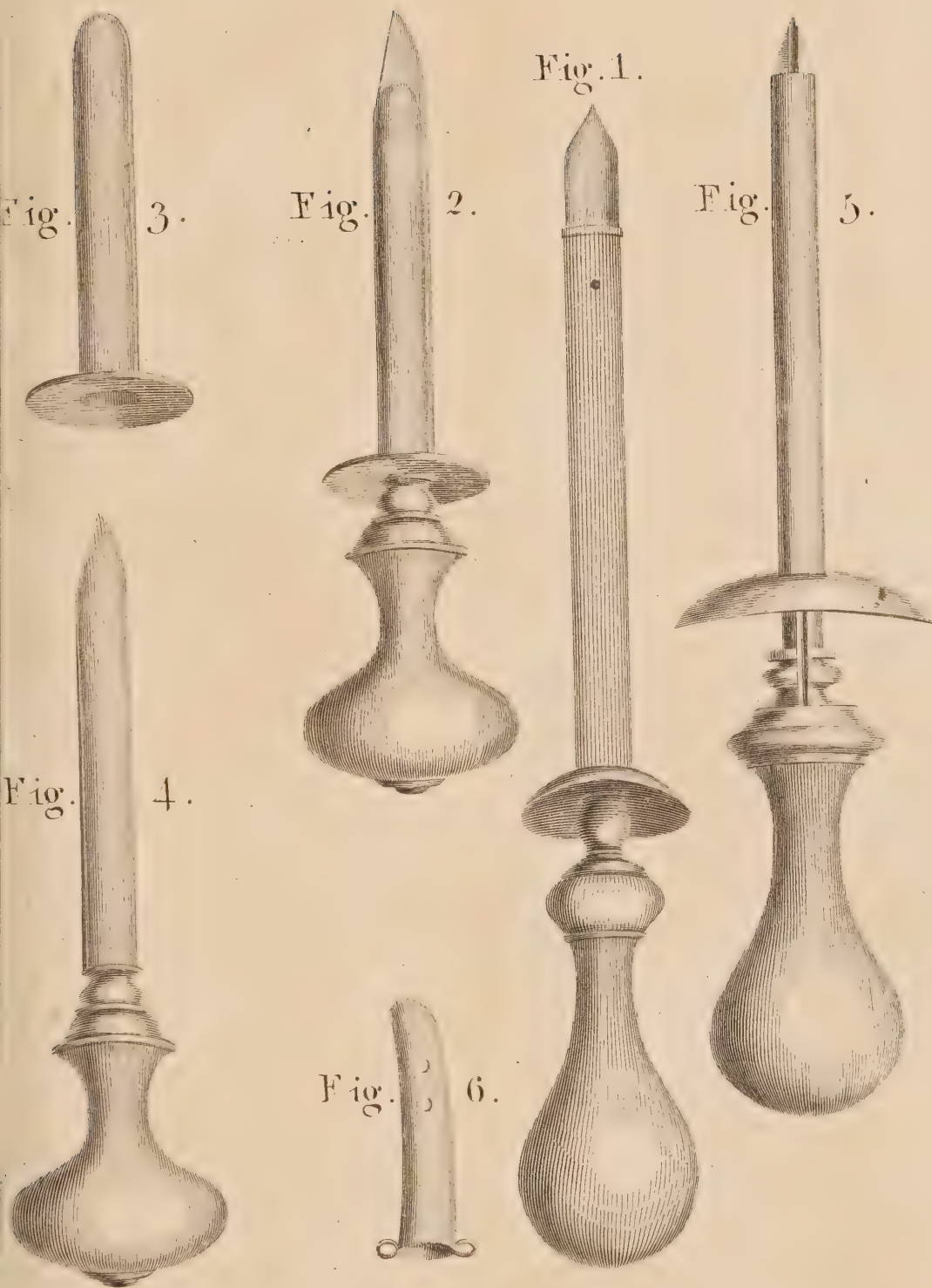
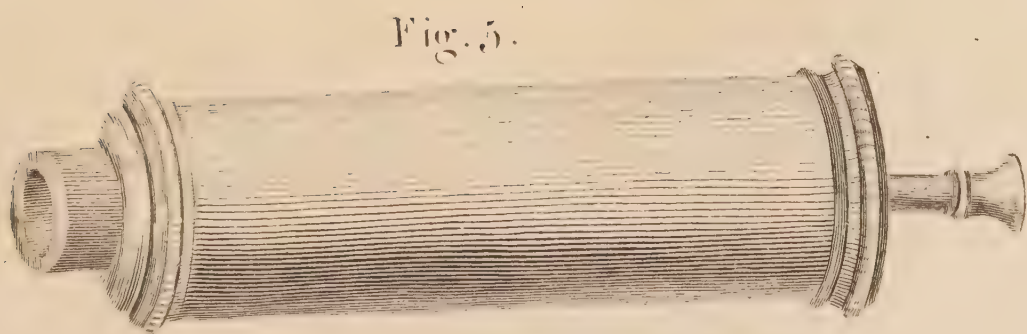
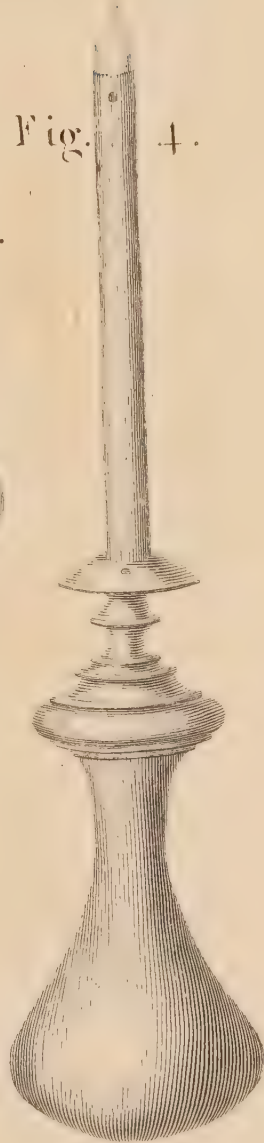
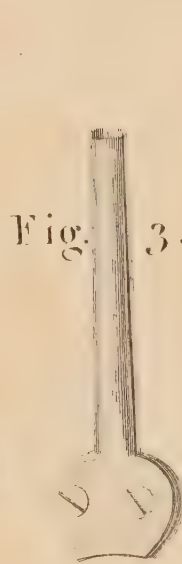


PLATE LX.



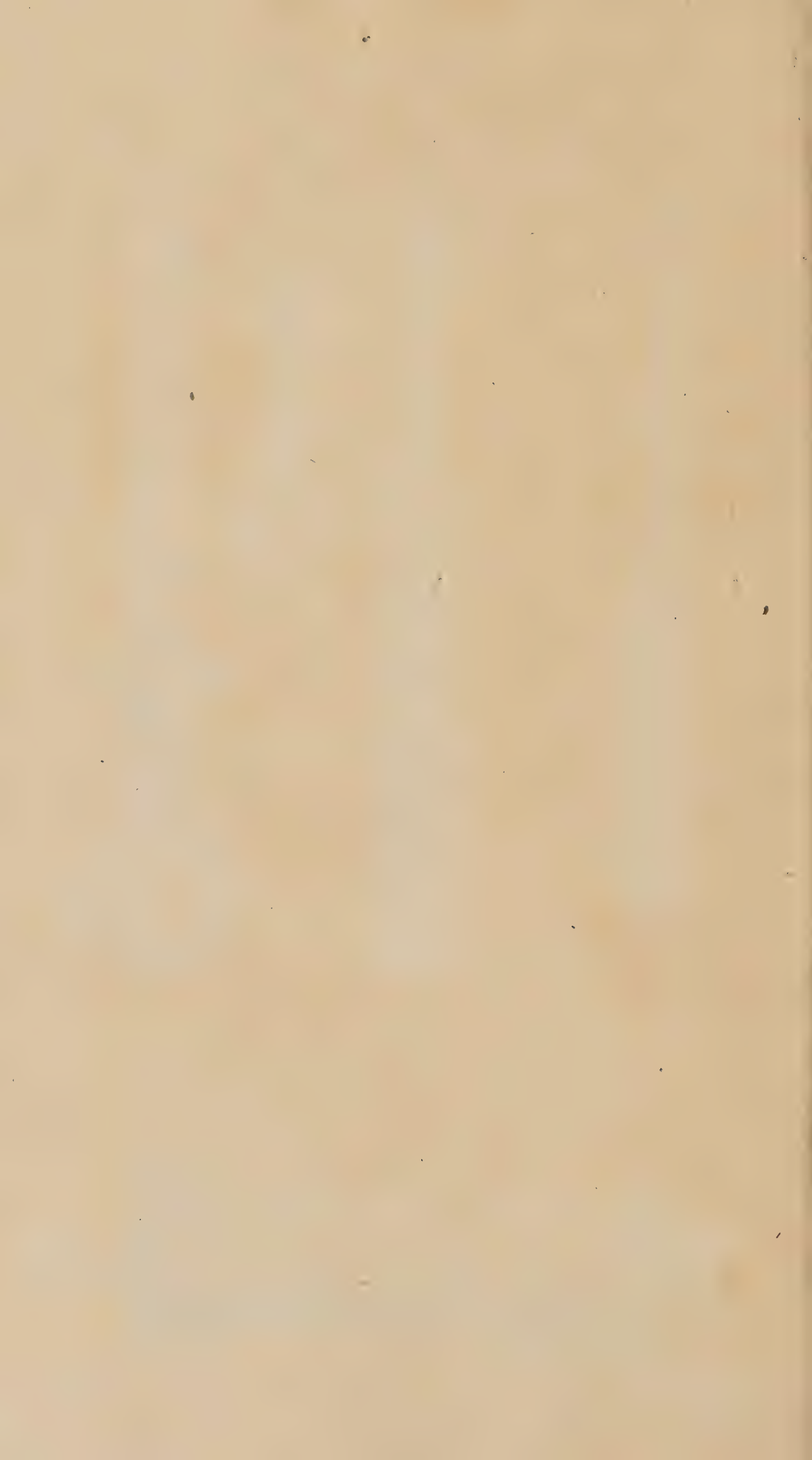


PLATE LX.

Fig. 1.

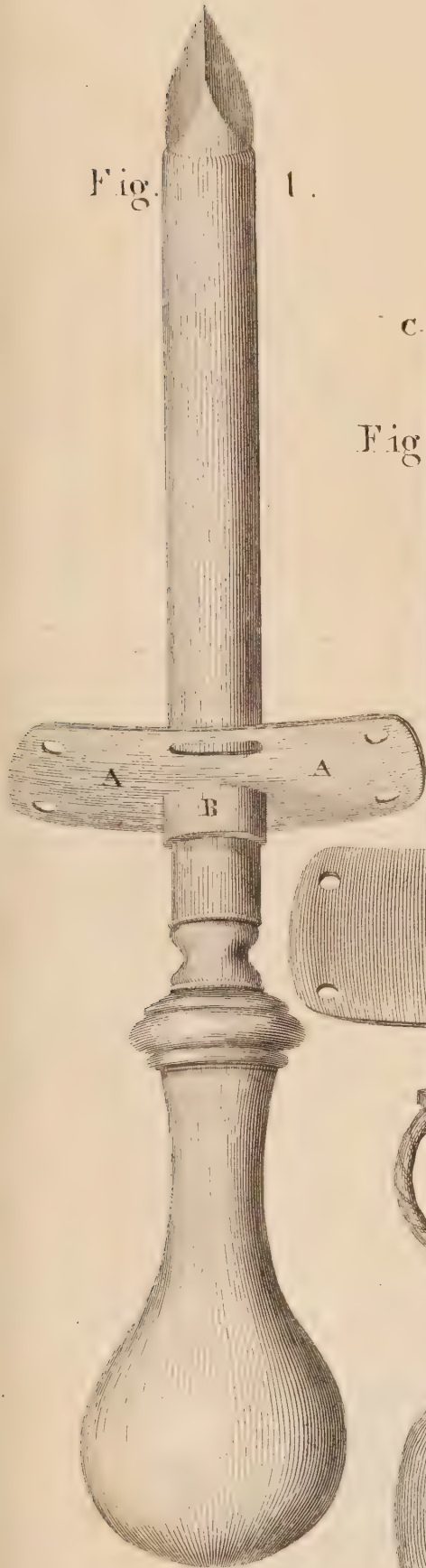


Fig. 2.

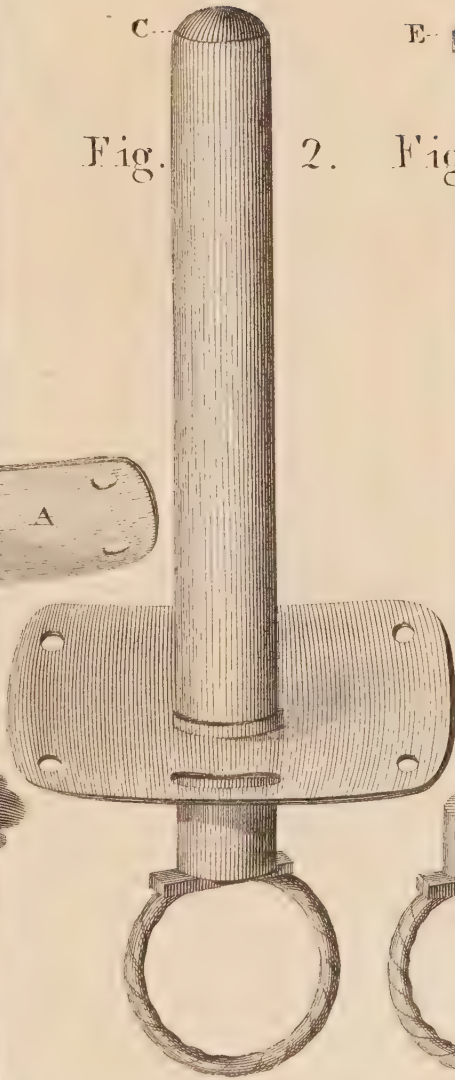


Fig. 3.

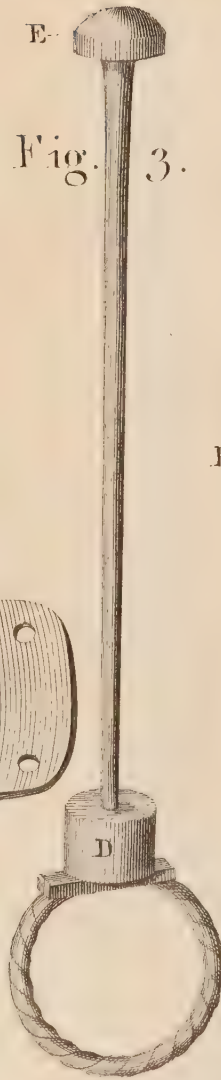


Fig. 4.



Fig. 5.

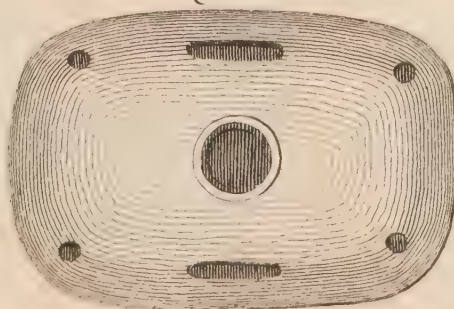


PLATE LXIII.

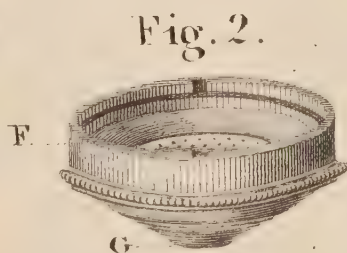
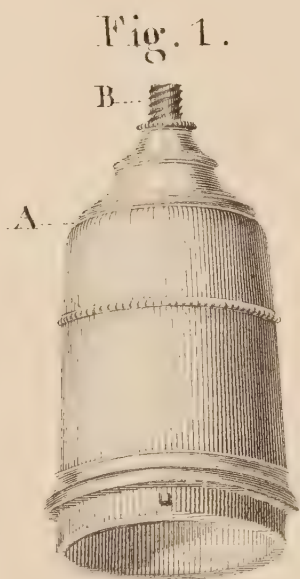


PLATE LXIV.

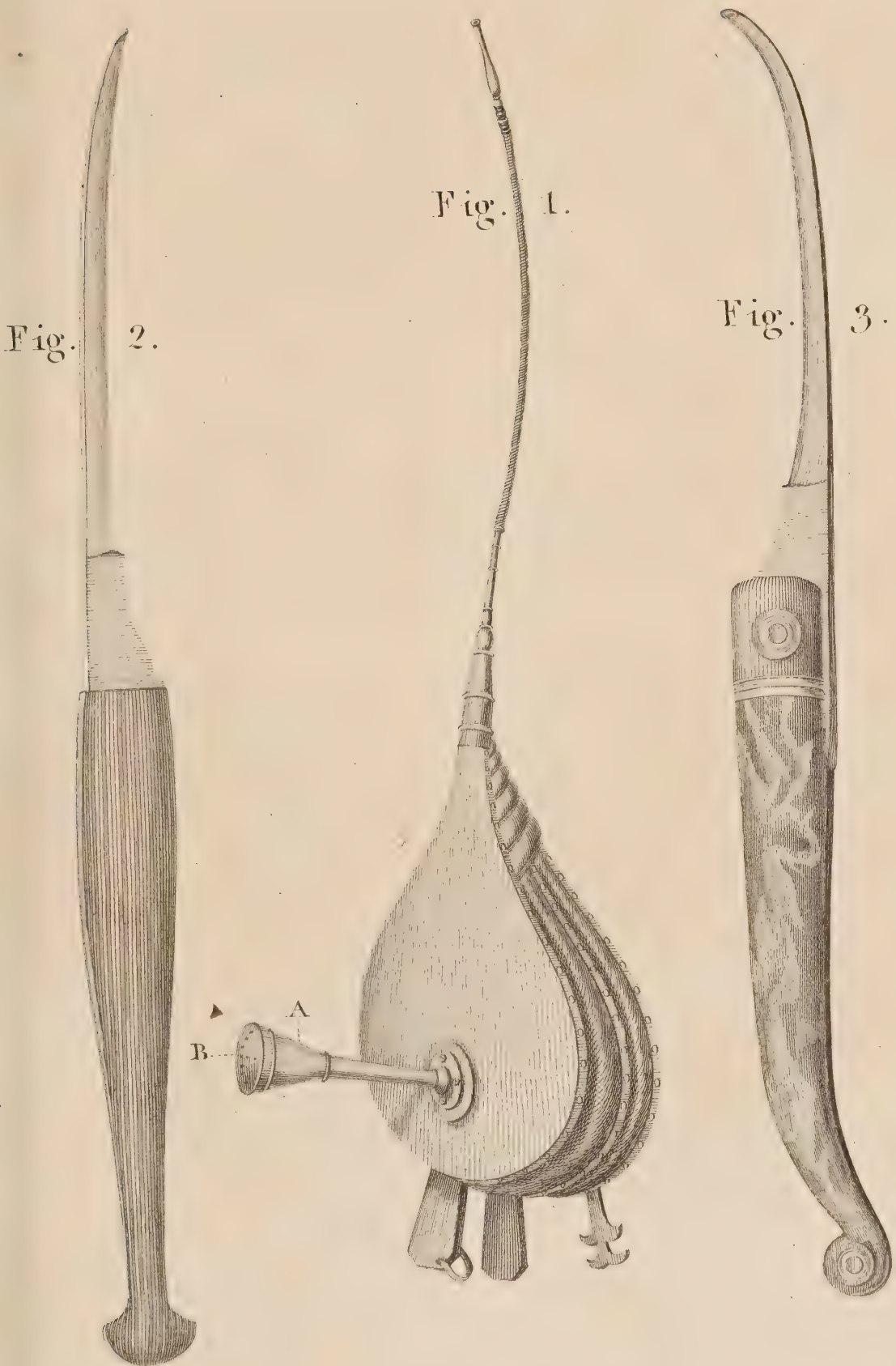


PLATE LXV.

Fig. 1.

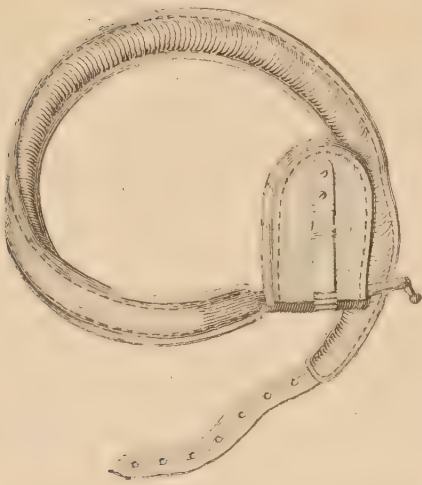


Fig. 2.

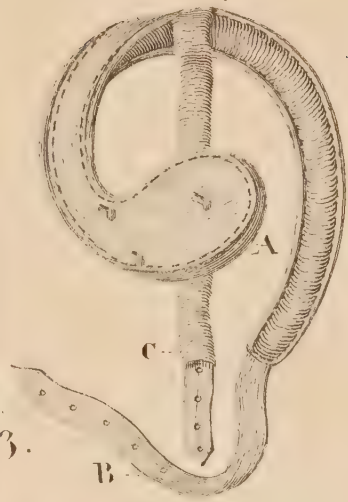


Fig. 3.

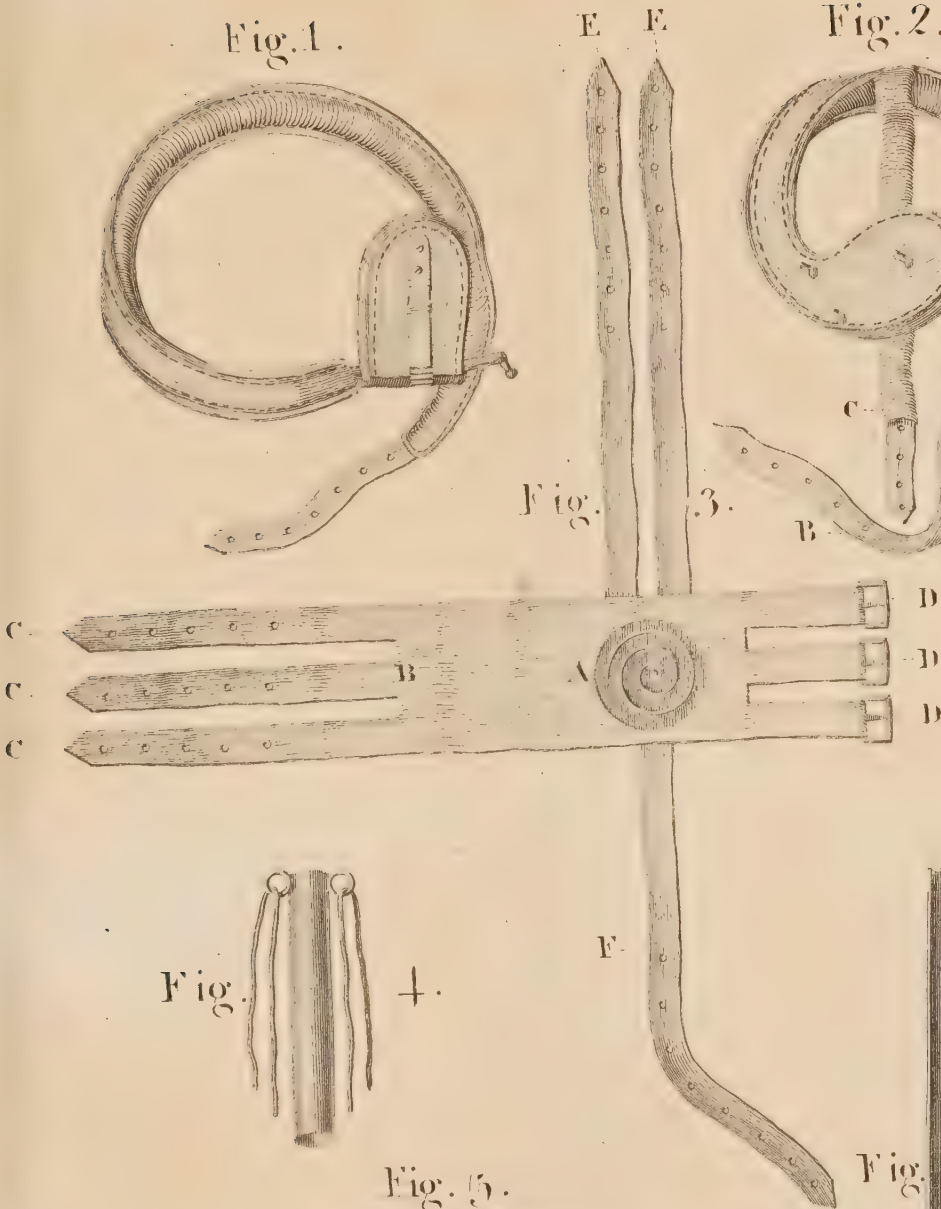


Fig. 4.



4.

Fig. 5.

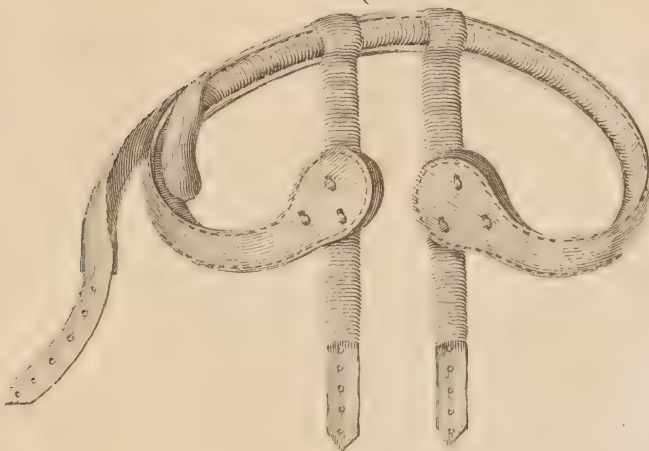


Fig. 6.

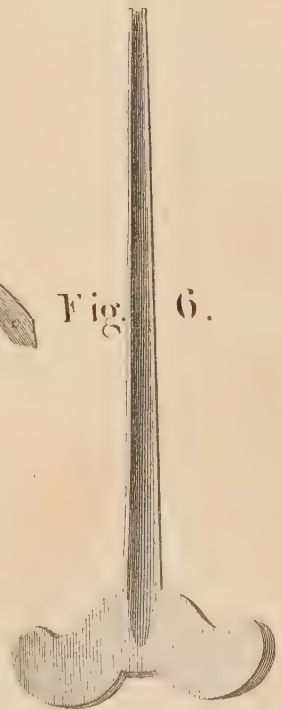


PLATE LXVI.

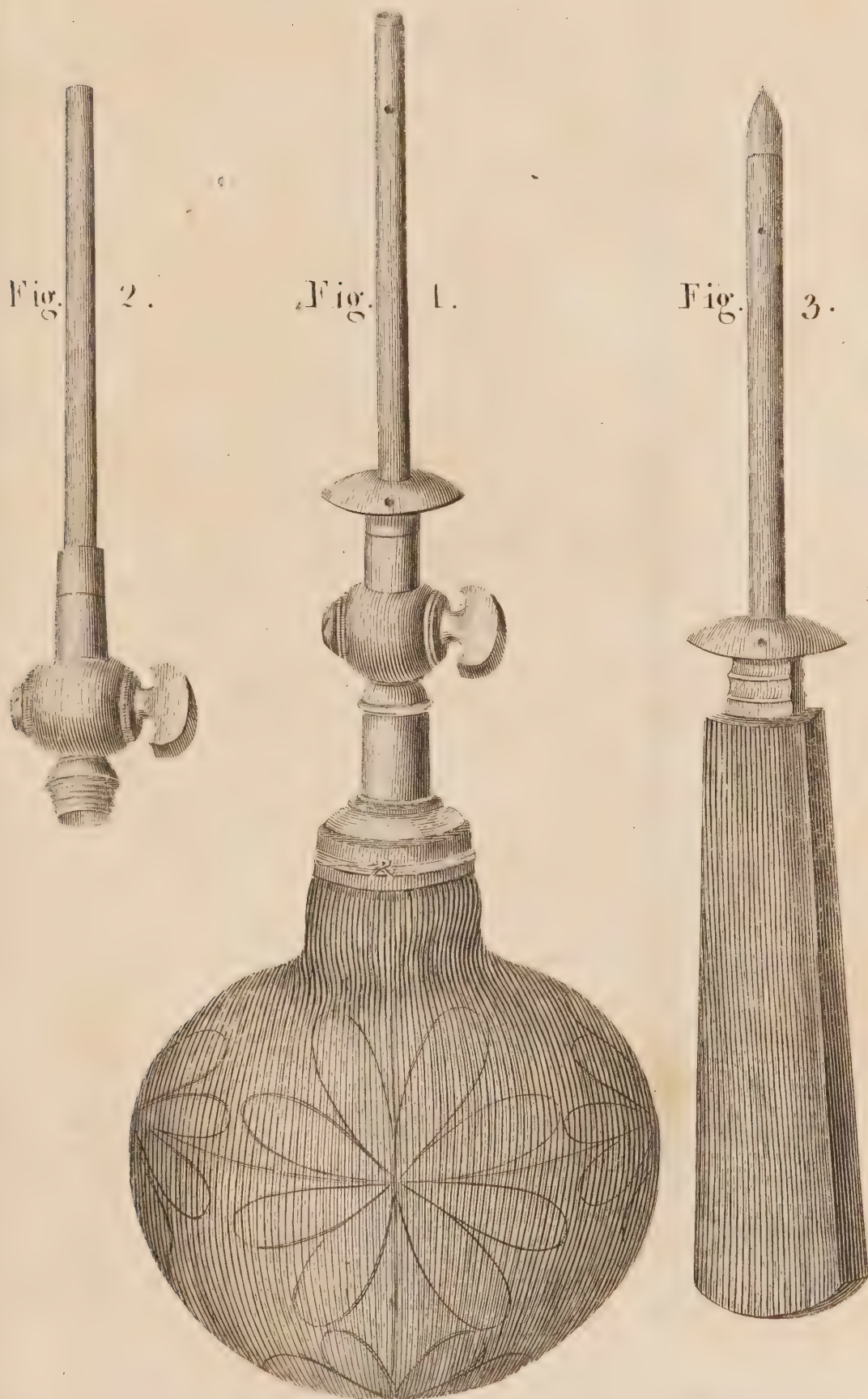


PLATE LXVII.

Fig. 1.



Fig. 2.

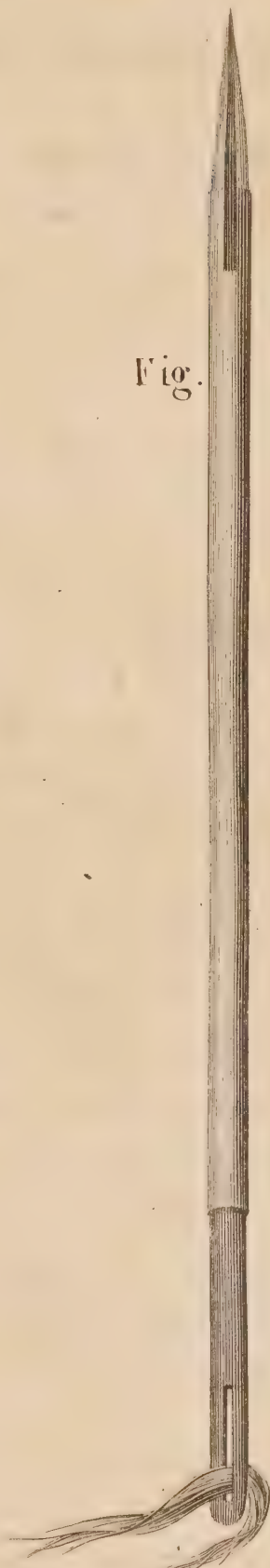
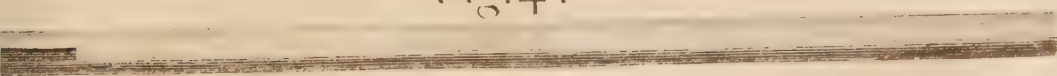


Fig. 3.



Fig. 4.





EXPLANATION
OF THE
P L A T E S.



PLATE XLI.

Fig. 1. **A** Speculum oris, which I proposed a considerable time ago, and which in different cases has been used with advantage. By occupying less space in the mouth than the instruments in common use, it may be employed where they are inadmissible. *B*, A handle of timber, through which the screw

L 1 3

A C

A C is passed, by which the plate of iron *D* may be more or less separated from the fixed plate *E*, by turning the nut *A*. The plates *D E* should be sufficiently firm for resisting the pressure of the jaws, and covered with leather or cloth to prevent the teeth from being injured.

Fig. 2. Another form of a speculum for the mouth. *GH*, Two firm iron plates, which being inserted between the teeth of the upper and under jaws, may be separated to any necessary degree by turning the handle *F*. The farther extremity of the plate *G* is intended to compress the tongue, an addition which may be easily made to fig. 1.

Fig. 3. The instrument in common use as a speculum oris; but it is so defective that it can seldom be used with advantage.

PLATE XLII.

Fig. 1. A kind of cutting forceps, the invention of the late Dr John Aitken:
They

They may be employed either in the hare-lip, or for the removal of cancer of the lip: One blade of the forceps is a plane smooth surface, while the other is furnished with a sharp-cutting edge. In using this instrument the two blades must be pressed against each other with one hand, with a force sufficient to divide the parts that are meant to be cut; while the other hand is employed in securing the handles.

Figs. 2. and 3. Forceps, for laying hold of the lip in performing the operation for the hare-lip, or in removing cancers of the lip, by which the parts are more securely fixed, and may be more neatly cut than when held with the fingers only.

In fig. 2. the blades are both lined with timber, and the blade *AA* being considerably broader than the other, the lip may be divided by cutting directly down upon it, and carrying the scalpel in close contact with the side of the opposite blade.

PLATE XLIII.

Fig. 2. Scissars of a sufficient size and strength for dividing the parts in the operation for the hare-lip.

Fig. 2. Cutting pliers for the purpose of removing small splinters of bone wherever they are met with, particularly in the amputation of limbs.

PLATE XLIV.

As the cure of the hare-lip is a point of much importance, I have judged it proper to delineate the appearance of the disease, together with that of the parts in which it is seated during the different stages of the operation and cure.

Fig. 1. A hare-lip, in its most common form. *A*, One of the incisores appearing in the centre of the opening, which ought to be removed before the operation, as a tooth in this situation is very apt to interrupt the cure. *BB*, The unequal edges

edges of the fissure with which hare-lip is very commonly attended.

Fig. 2. The appearance of the parts after the edges of the fissure have been removed and the pins introduced. *CC*, The edges of the cut, which ought to be smooth, equal, and exactly of the same length on each side, so that when drawn together no inequality may take place. The first pin should be inserted near to the under part of the lip, and the upper pin near to the superior point of the fissure. The pins represented in this figure are furnished with moveable steel points, so that the points may be taken away on the ligatures being applied, as is done in fig. 3. which exhibits the appearance of a hare-lip immediately after the operation.

Fig. 4. A lip after the cure is finished. *D* Represents the appearance of the cicatrix, which in general should be nearly a straight line.

Fig. 5. A flat pin for the operation of the hare-lip. The pin itself, fig. 6. should

should be of gold, and the point, fig. 7. of steel.

PLATE XLV.

Figs. 1, 2, 3, 4, and 5. Different forms of scaling instruments for removing tartar and other extraneous matter from the teeth.

Figs. 6. and 7. Instruments that may be employed either for burning the nerve of a tooth, or for stuffing a hollow tooth with gold or lead. Fig. 8. may likewise be employed for the same purpose, but it is more frequently used for searching behind and between the teeth, when there is any suspicion of a latent caries that is not readily discovered.

Fig. 9. Another instrument for stuffing carious teeth. And,

Fig. 10. A handle to which all these instruments may be fitted.

PLATE XLVI.

Fig. 1. The instrument commonly termed a key for extracting teeth. After many alterations being made in it, the one here delineated is the best I have ever used.

In fig. 2. the instrument in common use, the claw is fixed, and can only be moved by taking out the screw by which it is connected with the instrument; but in fig. 1. the claw can be moved from one side to another, merely by pressing upon the nut *A*, by which the spring *B* is raised out of a niche in a wheel which is thus rendered moveable, and in which the claw is fixed. *C*, The heel of the instrument which is here represented not only of a greater depth, but considerably longer than usual: Of this length it is applied to a considerable extent of gums, by which the jaw is not so apt to be injured as when the heel is much shorter; and of this depth it acts with more
power

power than when of the usual form. This part of the instrument should not only be well polished, but thickly covered with several plies of soft old linen in order to render the pressure produced by it upon the gums as easy as possible. The handle *D* is sometimes made of iron; but it answers better either of ivory or timber.

Fig. 3. A claw bent in such a manner, that when the heel of the instrument *C* is placed upon any part of the gums, the second or third tooth farther in the mouth, may be pulled with it. This proves sometimes useful, where the gums opposite to the affected tooth are particularly tender; and it should always be employed when it is meant to pull either of the two farthest molares of the lower jaw outwards; for in using the common instrument for these teeth, the gums that cover the projecting part of the coronoid process of the jaw are always much lacerated.

Figs. 4. and 5. Two claws of different sizes of the ordinary form.

PLATE

PLATE XLVII.

Figs. 1. and 3. Two instruments much employed in different parts of Europe for extracting teeth. They do not, however, possess any advantage over the key-instrument; and they are liable to this objection, that they cannot be used where a tooth must be turned towards the inside of the mouth.

Fig. 1. *A*, The fulcrum, which ought to be well covered with soft old linen or cotton: *B*, The claw fixed to the handle *E*, by a small hole in the end of it, which receives a knob of a corresponding size, at *C*, and is retained in its situation by a moveable plate of polished iron *D*. The handle should be wood, and all the rest of the instrument iron or steel. Fig. 2. A claw with a considerable degree of curvature, for extracting teeth at a greater depth in the mouth than the fulcrum can be placed at.

Fig.

Fig. 3. *F*, The fulcrum. *E*, A straight claw fixed to the instrument by a screw at *H*. *I*, The handle, which should be of wood.

PLATE XLVIII.

Figs. 1. 3. and 4. Different forms of forceps for extracting teeth. Fig. 3. is the most useful of any that I have seen.

Fig. 2. Small dissecting forceps employed in different operations in the mouth, as well as in other parts.

PLATE XLIX.

Fig. 1. Teeth forceps with moveable claws, *A*. And,

Fig. 2. A fulcrum to be used along with the forceps, fig. 1., both described in Vol. V. p. 53.

Fig. 3. An instrument for dividing the frænum linguæ.

PLATE L.

Figs. 1, 2, and 3. Different forms of a punch or lever for extracting stumps of teeth. Figs. 1. and 3. are the best. They consist of two parallel plates of polished iron, which may be separated more or less by pressing the moveable sliders *AB* higher or lower.

Fig. 4, 5, 6, and 7. Different forms of files for removing inequalities upon teeth. Some of these should have one side entirely smooth, so that in acting upon a diseased tooth, the contiguous sound tooth may not be injured.

PLATE LI.

Fig. 1. A very ingenious improvement of the key-instrument by Mr Robert Clarke, surgeon in Sunderland. The points in which this instrument chiefly differs from the key in common use, are the
the

the manner in which it is connected with the handle *AB*, the form of the claw *C*, and of the fulcrum or rest *F*, and the bend in the shank at *DE*, by which in drawing teeth inwards, the foreteeth are more certainly avoided than can be done with the common instrument.

This instrument is also so contrived that the claw can be quickly changed or turned to an opposite direction, by means of a sliding bolt passing through the claw, instead of a screw: but for a more particular account of it, see *Medical Facts and Observations*, London, Vol. VI. Art. VIII. by which Mr Clarke seems to have made some alterations in the form of the instrument; the one that he there describes being somewhat different from that which the cutlers here have made of it.

Fig. 2. Is an instrument, from which, in particular circumstances of incontinence of urine, much advantage may be derived. It was worn by a Dutchman who presented himself at this place three winters ago, with a singular and curious conformation
of

of part of the organs of urine and generation, of which an account has already been published.

ABC. The body of the instrument so constructed as to be exactly adapted to the parts on which it is applied: This, as well as all the rest of the machine, should be made of silver, with the edges properly stuffed with leather, flannel, or cotton, for protecting the skin on which it rests, and which is easily done by means of a number of small holes round the whole of it at *C*. It is fixed to a circular belt round the loins by two pieces of tape, one at the opening *A*, and another on the opposite side of the instrument, which in this view of it cannot be seen, and at *E* there is another piece of tape which goes between the legs, and fixes it to the circular belt behind.

This instrument proves particularly useful to all who are distressed with incontinence of urine, accompanied with fistulous openings in the scrotum or contiguous parts that communicate with the urethra,

and it is even easily adapted to these parts, so as to cover entirely the scrotum and penis, by which it may be employed with advantage in every variety of the disease.

When urine passes either from the penis, or from fistulous openings that communicate directly with the bladder, it runs down to *D*, the entrance into the receptacle *E F*, which contains several ounces, and from whence the urine cannot again return, but passes out at the outlet *G*, as often as the patient finds it convenient to remove a well-adapted cork with which the opening *G* should be furnished.

PLATE LII.

Figs. 1, 2, and 3. Different forms of instruments employed for concentrating sound in cases of deafness.

Fig. 4. A syringe of a proper size for washing the meatus auditorius.

Figs.

Figs. 5. and 6. Instruments for perforating the lobes of the ear.

PLATE LIII.

All the figures in this plate represent glasses for drawing milk from the breasts of women. With figs. 1. and 3. the breast may either be sucked by the person herself, or by an assistant; and fig. 2. is a glass cup, mounted with a bag of elastic gum. *A*, The glass cup joined to the bag *C* by the intervention of a brass tube *B*.

PLATE LIV.

Fig. 1. An instrument for supporting the head after the operation for the wry neck. *ABC*, A curved plate of iron, covered with soft leather and properly stuffed, fitted to the shoulder, and supporting another plate,
M m 2 to

to the top of which is connected the plate *DEF*, upon which the head is meant to rest, and which should also be covered with soft leather or cotton. *GHI*, A buckle and strap for fixing the instrument round the neck.

Figs. 2, 3, and 4. Different kinds of cups, which may be either of ivory, lead or silver, for covering and protecting the nipples, when they are either chopped or otherwise diseased. The holes in their brims are for receiving pieces of small tape for fixing them round the body.

Fig. 5. A broad flat needle, of a lancet-form for introducing cords or setons in different parts of the body.

PLATE LV.

Fig. 1. This figure is the invention of Mr Chabet of Paris, and is taken from the Second Volume of Memoirs of the Royal Academy of Surgery : It is the best instrument

instrument that has yet been published for compressing the jugular vein.

Fig. 2. A curved grooved director, for introducing a seton or cord along the course of an abscess.

PLATE LVI.

Fig 1. An instrument for fixing the canula after the operation of bronchotomy. *A*, A plate of thin-polished steel, with a curvature corresponding to the anterior part of the neck. *BB*, The extremities of the plate *A*, with which the straps *CC* are connected, for the purpose of fixing the instrument by means of a buckle on the back-part of the neck. *E*, A moveable frame, which should be made to pass easily up and down on the two perpendicular branches of polished steel *DD*, fixed to the inside of the plate *A*. In this frame there is an opening a little above *E*, for receiving the double canula represented by the inferior letter *F*. The letter *F* opposite to *E*, re-

presents a small screw, which passes through the under-part of the frame ; and by pressing upon the under-part of the canula, it thus serves to fix it exactly where it is placed after the operation.

As the frame is made to slide easily upon the two branches *DD*, and as the double canula *F* can be inserted to any depth in the trachea, and can be fixed by the screw passing through the under-part of the frame, this instrument is accordingly found to answer every purpose expected from it. It is the invention of Dr Monroe, and it has in different cases been employed with advantage.

Fig. 2. An instrument for perforating the trachea in the operation of bronchotomy. *G*, The point of the perforator passing through the double canula *H*.

Fig. 3. A representation of the double canula unconnected with the perforator.

PLATE LVII.

Figs. 1. and 2. Two instruments termed Probangs, for the purpose of pushing such substances into the stomach as are fixed in the œsophagus. It consists of a piece of soft sponge, firmly tied to a piece of flexible whalebone, fifteen or sixteen inches in length. The whalebone should be well polished; and in order to render the introduction of it as easy as possible, it should be dipped in fine oil.

Fig. 3. A scarificator, for the purpose of opening abscesses in the fauces, or for scarifying the amygdalæ when inflamed.

Fig. 4. The scarificator covered with a silver canula. *A*, The handle of the scarificator; *B*, a screw-nail fitted to the hole in the scarificator; by which the length of the point to be left uncovered at the extremity of the canula *C* may be exactly regulated.

PLATE LVIII.

Fig. 1. A flat trocar.

Fig. 2. Another form of flat trocar, a very neat invention of Mr Wallace, a surgeon of eminence in Glasgow. This instrument consists of a stilette or perforator, fig. 4. exactly adapted to the silver canula, fig. 3. The canula is open on one side, which admits of the perforator being broader than itself, as is represented in fig. 2. By this means an opening is made by the perforator, which allows the canula to pass with ease, and as the sides of the canula do not fall together on the perforator being withdrawn, this instrument is not liable to an objection that occurs against the trocar of Mr André, represented in Plate LIX. fig. 2. with which there is some risk of the steel plates doing harm to the contents of the abdomen on these plates falling together, which they do with some force on the canula being withdrawn.

Fig.

Fig. 5. A trocar of a common triangular form, for the purpose of puncturing the bladder: The round or triangular form of this instrument makes it more proper for this operation than trocars with a lancet point, which are not so well adapted for the different steps of the operation; and the groove in the filette or perforator, by commencing at the point, and being continued through the whole length of it, serves to mark with much certainty its entrance into the bladder, for the urine flows along the groove immediately on the point of it having entered the bladder.

Fig. 6. A flat silver canula, with a small curvature for leaving in the opening after the operation for the empyema.

PLATE LIX.

Fig. 2. A trocar, the invention of Mr André. Fig. 3. The canula of this instrument

ment is formed of two hollow plates of elastic steel, firmly united together at their larger extremities by two screw-nails. The tube formed by these two hollow plates is of such a size as to allow the perforator, fig. 1. to be pushed into it with very little force; and the elasticity of the plates, which admits of their yielding to this passage of the perforator, enables them to return instantly to form the same size of tube, as soon as the large extremity of the instrument *A* has fairly passed the extremity of the plates.

The point of the perforator with a small portion of the extremity of the tube being pushed into the vaginal coat, the perforator is to be then withdrawn, which, when the instrument is properly made, may be done without much force.

The chief advantage of this instrument is, that the point of the perforator making a larger opening than the canula, the latter thereby enters with much ease.

But although this invention of Mr André's

dré's is neat and ingenious, it does not appear to be very necessary ; for, when the flat trocar, fig. 4. of the same plate is well finished, and the silver at the extremity of the canula is thin and properly fitted to the perforator, it enters with sufficient ease, as also happens with the trocar of Mr Wallace, described in fig. 2. Plate LVIII., while neither of these instruments is liable to the important objection that occurs to that of Mr André, noticed in the explanation of that plate. The canula of Mr André's instrument has also this disadvantage, that being made of polished steel, it is almost impossible to make it so dry after being used, as to prevent it from suffering with rust, where the two plates are fixed together by screw-nails.

Fig. 5. A syringe for throwing liquids into the tunica vaginalis testis in the cure of hydrocele by injections, for which purpose it requires to be exactly fitted to the tube fig. 2, Plate LXVI.

PLATE

PLATE LX.

In this plate is represented what I consider as an important improvement on the apparatus for perforating the bladder above the pubes, an operation of much moment, in so far as it is never performed but in cases of great danger, and although easily done, is apt to induce such a number of distressful consequences, as nothing but a continued course of attention, combined with much experience, and many opportunities of performing the operation, can tend to obviate.

By experience I have found, that the common trocar does not answer so well for this operation, as one of a larger diameter, and one of a round form answers better than a flat one, for a large round one does not so readily injure the bladder.

Fig. 1. A trocar of a proper size, both in length and diameter. *A A*, a moveable
cape

cape or shield, fixed on the canula *B* by means of a screw, and from which it can at any time be easily removed. The flits and holes in the cape, as may be more particularly seen in the front view of it, fig. 5. serve to attach pieces of small tape, for the purpose of fixing the canula to a circular belt previously fixed round the loins: As it is a point of much importance in this operation, to have the canula kept steadily in its place, I have sometimes done it by fixing adhesive plasters to the cape of the canula, and applying the plasters firmly upon the contiguous parts: With some, this has answered better than bandages, but others have preferred the tapes attached to a circular belt. In one case, where it answered remarkably well, the cape of the canula was sewed to the circular band, by passing the threads through the few small round holes, and the canula, as well as the belt, was prevented from moving either upwards or downwards, by two double pieces of tape,
attached

attached to the canula at the long flits, two passing over the shoulders were carried backwards and fixed to the circular band behind, while the other two being carried downwards, one on each side of the scrotum was also fixed to it behind. In this manner, after various methods had been tried in vain, the canula was easily kept in its situation.

The next object of importance, is to prevent the back-part of the bladder from being hurt by the friction of the canula: This we endeavour to do by using a trocar that will not probably reach so far; but even with this in view, the sharp edges of the canula are apt to hurt the bladder. It is however effectually prevented by the addition of fig. 3., a firm silver wire with a round button or stopper of silver *E*, which removes the sharp edges of the canula, as is seen at *C*, fig. 2. If *E* is exactly adapted to the canula, no urine gets into it, by which no calculous incrustation forms in it, as is apt to happen

pen where this precaution is omitted. *D* being a plug of common cork, the stopper is thereby prevented from falling out.

The patient should be warned to remove the stopper frequently, and to empty the bladder; for where this is neglected, the urine necessarily escapes between the bladder and canula.

It is scarcely necessary to remark, that the canula must in every instance be worn till the urine flows freely off by the urethra. In a great proportion of cases this happens in the course of a short time, but in some not till many months have elapsed. During the inflammatory state of the disease, the bladder commonly forms such adhesions to the contiguous parts, that after the canula has remained long inserted, we might, in various instances, withdraw it for the purpose of clearing away any incrustations that form in it, as in a great proportion of cases, it could be easily inserted again: But as these adhesions do not always happen, and as much
danger

danger would occur from our not being able to replace the canula, it ought never to be withdrawn till another canula is inserted, which is easily done, in the following manner :

Let a canula be provided, somewhat more than double the length of the other, and of a size that admits of its passing easily through it : This canula must consist of two pieces screwed together, as is represented at F. fig. 4. The shortest piece being exactly the length of the canula of the trocar, being all passed into it, the canula of the trocar is then to be withdrawn, by pulling it along the whole length of the tube : After clearing the canula of the trocar, an attempt may be immediately made to replace it, by pushing it along the tube into the bladder ; and in such attempts we commonly succeed : But we derive a very important advantage from having the long tube previously inserted, as the patient remains in security in the event of our not being able to

to pass the other again into the bladder, as in some instances has been the case: In this case, a cape or shield, with an opening fitted to the diameter of the small tube, must be fixed upon it at the screw *H*, when by undoing the connection of the two parts of the tube at the screw *F*, a canula is left exactly of the same length with that of the trocar, to be fixed in the same manner, and fitted with a corresponding plug or stopper, similar to fig. 3.

PLATE LXI.

The figures in this plate represent a set of instruments for the same purpose as those in the preceding plate, a very neat and elegant invention by Dr Monro, and the following explanation of them is in the Doctor's own words:

Fig. 1. A trocar of an ordinary shape, and of a proper size.

VOL. V.

N n

Fig.

Fig. 2. A steel canula with a handle: The canula is open on one side, and thin at its point, that it may pass easily with the trocar into the bladder.

Fig. 4. Gives a side view of a blunt silver canula, which, after the trocar is withdrawn, is to be introduced through the steel canula, which has a broad shield with holes in it for fixing it by ligatures in its place: Two views are given of the canula; the oblique view of it shews the direction that it should have in passing into the bladder, which should be downwards and backwards, that it may be in less danger of injuring the back-part of the bladder. *A*, a plate to be held between the finger and thumb, while the steel canula is withdrawing. *B*, the end of the silver canula, to be passed through a hole in a piece of waxed or oiled silk, and then tied to it: This piece of waxed silk saves the skin from being excoriated, and serves, besides, to direct, occasionally, the urine into a basin,

Fig.

Fig. 5. A small silver plug to be put into the end of the silver canula, in order to prevent the constant escape of urine: This is to be taken out from time to time, and the urine received into a basin.

Fig. 6. A perpendicular view of the shield. *A*, The top of the canula. *B*, a plate of metal which serves as a handle, and likewise to connect the canula to the shield. *C*, a large opening through which the handle *A* of the steel tube, fig. 3. may pass, and as the opposite side of the steel tube has a slit in it, the steel tube can be withdrawn after the silver canula has been passed through it into the bladder.

DDDD, Holes in the shield, by means of which, a circular strap put round the body, may be readily connected with it for supporting it exactly in its proper place.

PLATE LXII.

Fig. 1. A bistoury with a probe of flexible silver joined to it, for the operation of the fistula in ano, which in various instances I have used. It will be readily understood, that this instrument will not answer where the sinus does not communicate with the gut.

Fig. 2. A bandage for the paracentesis of the abdomen, originally invented by the late Dr Monro. This bandage should be made of soft leather, lined with flannel. *A*, the body of the bandage, which should be of such a length as to pass from one os ilium, across the abdomen, to the other, to be there fixed by the straps *BBBB* to the buckles *CCCC*. The straps *DD*, by passing over the shoulders, serve to fix the buckles *EE*, which pass through
between

between the thighs; by which almost every part of the abdomen may be sufficiently compressed. When the operation of tapping is to be performed, the bandage should be fixed in this manner, care being taken to leave the hole *F* open, exactly opposite to the spot in which the perforation is to be made, which for this purpose should be previously marked with ink. On the water being all drawn off, and a pledget applied upon the wound, the opening *F* must be shut by the strap *G*, and the buckle *H*, as represented by the letter *I*.

In this manner, any necessary pressure may be applied, which, after this operation, is of much importance, and ought not to be omitted.

PLATE LXIII.

Fig. 1, 2, and 3. represent different parts of a machine for injecting tobacco-smoke into the rectum.

N n 3

Fig.

Fig. 1. A brass box for containing the burning tobacco. The mark *A* is a bottom or division in the inside of the box, perforated with small holes to admit the passage of the smoke to the extremity of the box *B*; which, by a male screw, is adapted to a brass tube, fig. 3. at *C*, which is again fitted to an elastic leather-pipe *D*, terminated by a common glyster-pipe *E*. The pipe *D* is made of waxed leather, protected by brass wire rolled spirally round it from one end to the other.

Fig. 2. represents the covering of the box, fig. 1. to which it must be exactly fitted. *F*, a division of thin brass, perforated with a number of small holes for admitting the passage of the air from a pair of bellows fitted to the opening *G*.

Fig. 4. The instrument completely fitted on a small scale. *H*, a pair of double bellows, whose tube *I* is fitted by a screw to an opening in the cover of the box *K*, which again is terminated by the brass tube *L*, the leather-pipe *M*, and the ordinary glyster-pipe *N*.

The

The box *K* being filled with burning tobacco, and the glyster-pipe *N* being inserted into the anus, by working the bellows *H*, any necessary quantity of smoke may be very quickly thrown up.

It is scarcely necessary to observe, that all the parts of this machine ought to be exactly fitted to each other, with a view to prevent the escape of smoke at any of the joints.

Bellows of the ordinary size answer the purpose; and are preferable to those that are smaller, as being better calculated for injecting the smoke quickly. The brass-box for the tobacco should be about an inch and half in diameter, by three inches in length from the brim to the bottom; the brass tube connected with the box should be six inches in length, by a quarter of an inch in diameter. The leather-pipe ought to be of nearly the same diameter with the tube, and about two feet and a half in length. When of this length, it is easier managed than when shorter; and

it serves more effectually to cool the smoke before it reaches the bowels.

The glyster-pipe, at the end of the leather-pipe, ought to be somewhat larger and wider than those in ordinary use.

PLATE LXIV.

Fig. 1. Another instrument for injecting tobacco-smoke, originally invented by the celebrated Professor Gaubius. The principal difference between this and the instrument represented in Plate LXIII. is, that in this the tobacco-box *A*, is fitted to the air-hole of the bellows; so that in working the bellows, the air with which they are supplied entering at the openings *B*, the smoke of the burning tobacco must accordingly pass through them; and from the bellows it is thrown into the other parts of the instrument, and in that manner transmitted to the intestines.

The

The instrument represented in Plate LXIII. is wrought with more ease than the one here delineated.

Fig. 2. A crooked bistoury, with a blunt or probe point. The curve here represented is much less than is usually given to this instrument, and the blade is also much narrower: It ought, indeed, to be altogether straight, excepting a very slight curvature towards its point.

This bistoury is well calculated for dividing the stricture in cases of hernia; for opening sinuses in every situation; and particularly for dividing the rectum in the operation of the fistula in ano.

Fig. 3. A bistoury with a greater curvature than the other, which in sinuses of particular directions sometimes proves useful.

PLATE LXV.

Fig. 2. A spring truss for an inguinal or femoral hernia of the right-side. *A*,
the

the bolster or pad for pressing upon the opening at which the parts protrude. *B*, a strap with holes in it for fixing upon the knobs on the back-part of the pad. *C*, a strap hanging down from the back-part of the bandage, to be passed between the legs of the patient, and to be also fixed upon the knobs of the pad by the holes in its extremity.

This strap is intended to fix the bandage firmly in this situation; but if the bandage is properly made, and the steel-spring of which it is composed is sufficiently elastic, there is no necessity for this strap, which always frets and galls the parts upon which it is made to pass.

Fig. 1. Represents a bandage also for the right side, but with no back-strap, and by means of a retch the pad can be made to compress the parts more or less even after the belt is fixed.

Fig. 5. A double bandage for a hernia on each side, with two back-straps connected with it.

The

The steel of which these bandages are made should be covered with thin soft leather, properly stuffed with wool or flannel. The pads should be broader than they are usually made, with a prominence or slight elevation in the middle, and their sides perfectly flat.

Fig. 3. Represents a bandage for umbilical ruptures. *A*, a steel spring to be applied upon the umbilicus after the hernia has been reduced, and to be retained in its situation by the bandage *B*; which, by means of the straps *CCC* and the buckles *DDD*, may be kept at any degree of tightness. *EE*, two straps for passing over the shoulders; and *F*, a strap for passing between the legs, the whole to be fixed upon knobs on the back-part of the bandage opposite to the spring *A*. By means of these buckles and straps, the bandage may be preserved very firmly in its situation.

The belt *B* should be five or six inches broad, and the steel spring *A* should be of

a size proportioned to the opening it is intended to press upon. All the parts of the bandage should be of soft leather, lined with flannel or cotton *.

Fig. 4. A silver canula for passing into the urethra after amputating the penis: The threads attached to it are meant to fix it to a small circular roller round the penis.

Fig. 6. A small director, open at the point or extremity, a very useful instrument in the operation for the reduction of strangulated hernia.

PLATE LXVI.

The figures of this plate represent an apparatus for the cure of hydrocele with injections: The method of using it is described

* The spring here represented is taken from a figure represented by the late Dr Monro in his treatise on that subject. See his works in 4to.

scribed in Chap. XXIV. Volume V. page 482. The syringe, Plate LIX. fig. 5. may also be adapted to fig. 2. of this plate, and used instead of the bag of resina elastica, fig. 1.

PLATE LXVII.

The figures of this plate represent a set of instruments for the cure of hydrocele with a seton described in Chap. XXIV. Volume V. pages 436, 437.



